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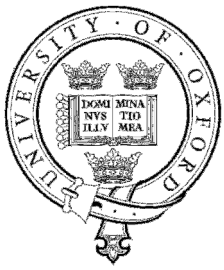

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Multidimensional Poverty Reduction in India between 1999 and 2006: Where and How?

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Abstract

India has witnessed high economic growth since the 1980s, and a reduction in the share of income poor, though the measured extent of this reduction varies, has been confirmed by different methods. Poverty, however, has multiple dimensions, hence this paper explores the improvement in other social deprivations. An analysis of poverty from a multidimensional perspective shows the prevalence of multiple overlapping deprivations among the poor. This paper analyses the change in multidimensional poverty in India between 1999 and 2006 using National Family and Health Surveys. We find a strong reduction in national poverty driven relatively more by some of the standard of living indicators, such as electricity, housing condition, access to safe drinking water and improved sanitation facilities, than other social indicators. The reduction, however, has not been uniform across different population subgroups and the pattern of reduction across states has been less pro-poor that of income poverty. In addition, the poorer subgroups have shown slower progress, widening the inter-group disparity in multidimensional poverty. In order to examine trends among the poorest of the poor, we define two additional subgroups of the poor and find that multidimensional poverty reduction has been accompanied by even stronger reductions in the share of the poorest of the poor by both definitions. The in-depth analysis pursued in this paper can also be conducted for other developing countries.

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The Oxford Poverty and Human Development Initiative (OPHI) is a research centre within the Oxford Department of International Development, Queen Elizabeth House, at the University of Oxford. Led by Sabina Alkire, OPHI aspires to build and advance a more systematic methodological and economic framework for reducing multidimensional poverty, grounded in people's experiences and values.

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1. Introduction

India has sustained strong economic growth at over five percent on average during every five-year plan since the 1980s.[1] Although growth in Gross National Income (GNI) has been much higher than most of her neighbouring countries, growth has not been as inclusive as some neighbours' – either in terms of reducing the proportion of income poor or in terms of improving many of the key social indicators. Granted, the share of people living below both the World Bank's $1.25/day poverty line and the national poverty line has fallen by nearly one percentage point per annum on average in the past two decades (GoI 2009, GoI 2012; see Deaton and Drèze 2002, Datta 2008, Ravallion 2008, Chen and Ravallion 2010), but this reduction has been much slower than the reduction in income poverty in Bangladesh, Pakistan and Nepal, despite these countries' having much lower GNI growth rates than India.[2] India's performance in key social indicators has been even less satisfactory. For example, both the improvements in DPT immunization rates among children aged 12–23 months and access to improved sanitation facilities in rural areas have been worse than most neighbouring countries and even worse than Sub-Saharan countries taken together.[3]

Poverty in India has traditionally been measured in terms of consumption and expenditure. The measurement of poverty remains centred on the ability to spend on goods and services rather than the capability to enjoy valuable beings and doings (Sen 1985), despite methodological revisions, debates (GoI 1993; Sen and Himanshu 2004; GoI 2009; Deator and Drèze 2002, 2009; Subramanian 2011), acknowledgement of the multidimensional nature of poverty (GoI 2009, p. 3) and of the need for inclusive growth (Ahluwalia 2011). Poverty is multifaceted and deprivation in per-capita expenditure is an important dimension of poverty. But, perhaps more surprisingly, income poverty does not accurately proxy other deprivations. Empirical studies have shown that significant percentages of those who are multidimensionally deprived are not income poor and vice versa (Laderchi, Saith, and Stewart 2003; Alkire and Kumar 2012). There is a need to supplement India's long and august tradition of monetary poverty measurement with multidimensional poverty measures that capture the joint distribution of deprivations across the population. Such measures can be used to track national poverty levels; to monitor changes by region, caste, and dimension; and to inform the Below the Poverty Line (BPL) targeting methodologies that are commonly non-monetary in nature (Alkire and Seth 2013).

In this paper, we analyse India's performance in multidimensional poverty between 1999 and 2006 using an adaptation of the Multidimensional Poverty Index (MPI), which is an international index of poverty introduced by Alkire and Santos (2010) in collaboration with the United Nations Development Program (UNDP). The global MPI has replaced the previously used Human Poverty Index (HPI-1) in the UNDP and has received serious attention both in academic and international policy arenas.

We compare an approximation of the MPI using the second and third rounds of National Family Health Survey (NFHS) datasets. The approximation enables us to make more precise comparison across two time periods. This being said, the global MPI calculated by OPHI and reported by UNDP's *Human Development Report* is more accurate because it uses richer

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[1] See GoI (2011–12), Table A4.

[2] See Table 2.1 on Page 7.

[3] See Drèze and Sen (2011) and also Table 2.1 on Page 7.

information. According to the 'official' international MPI, 53.7% of Indian people were living in households that were multidimensionally poor in 2005–06. The MPI-I approximation, which preserves comparability with previous (weaker) NFHS dataset, identifies only 48.5% of the population as multidimensioinally poor in the same year. Still, we show that the percentage of MPI-I poor people decreased statistically significantly from 56.8% in 1999, by 1.2 percentage points per year.

This finding supplements our understanding of reductions in national income poverty. We further explore where and how this reduction has taken place. To understand *where* the reduction has occurred, we explore the changes in poverty across various population subgroups, including states, rural/urban areas, castes, religions, and various household characteristics. We find that the reduction has not been uniform across all subgroups. The poorer subgroups, be they the poorer states or poorest caste or religious groups, have shown slower progress than the initially better off subgroups. This finding contrasts with the pattern of national income poverty reduction across states between 1993–94 and 2004–05 based on the National Sample Survey (NSS) datasets, where poorer states did not necessarily record slower progress.

Although between 1999 and 2006, the proportion of multidimensionally poor in India has gone down by 1.2 percentage points per year, this reduction has been much slower than that achieved by some of her neighbours, which are significantly poorer in terms of income. For example, Nepal reduced the percentage of poor people between 2006 and 2011, by 4.1 percentage points per year, while Bangladesh's poverty rates decreased by 3.2 percentage points per year between 2004 and 2007 (see Alkire and Roche 2013). Even India's best-performing states – Kerala and Andhra Pradesh – did not progress as fast as Nepal or Bangladesh in reducing multitidimensional poverty.

In order to understand *how* the poverty reduction has taken place, we ask several questions: Has poverty been reduced by reducing the number of barely poor people or by reducing the intensity of deprivations among the poor? Which dimensions have been reduced the most? Has poverty also decreased among those who are the poorest of the poor by various definitions? We find that poverty has mainly been reduced by a statistically significant reduction in the proportion of poor rather than a reduction in the intensity of deprivations among the poor. Comparing across states, we find that some states, for example Andhra Pradesh, have reduced poverty by mostly reducing intensity of poverty among the poor; whereas other states, for example Kerala, has reduced poverty by reducing the proportion of poor people. Nationally, absolute improvements in certain standard-of-living indicators – such as access to electricity, access to water, type of housing and access to improved sanitation facilities – have been larger than other social indicators.

To explore the situation of the poorest of the poor, we construct two different poverty measures. The first identifies the poorest people in terms of the intensity of their deprivations; these people are referred to as *intensely poor*. The second identifies the poorest people in terms of being more deeply deprived in each indicator; these are referred to as *deeply poor*. These two different subsets of the MPI do not coincide with each other, but both show statistically significant reductions in the proportion of the poorest of the poor. In fact, we find that the reduction in the proportion of multidimensionally poor has been accompanied by relatively faster reductions in both the proportion of intensely poor and deeply poor. The proportion of multidimensionally poor has gone down by 14.6% between 1999 and 2006; whereas the shares of intensely poor and deeply poor have gone down by 20.3% and 26.9%, respectively, during the same period.

Our paper advances as follows. Section 2 discusses India's performance in various monetary and non-monetary indicators and provides a motivation for analysing poverty from a multidimensional viewpoint in the Indian context. Section 3 outlines the methodology for the international MPI and its properties. Section 4 presents the amendments in the MPI indicators that were necessary in order to make the two rounds of NFHS datasets, and thus the poverty estimates, comparable across time. We present and analyse the national results in Section 5. Results and analyses across subgroups are presented in Section 6. Section 7 investigates the condition of the poorest of the poor using two different subsets of the poor: the intensely poor and the deeply poor. Section 8 concludes.

2. The Need for Multidimensional Assessment of Poverty

Over the past two decades, India's GNI per capita in current international dollars has grown at a rate of 6.8% per annum (p.a.), which can be found in Table 2.1. This growth rate is not as high as the growth rate of China, but it has been much higher than most of India's neighbours except Bhutan. Table 2.1 additionally reports the performance of the countries/regions in some key social indicators in the same spirit as in Drèze and Sen (2011). Has India's growth rate been inclusive – or, as inclusive as her neighbours – in terms of reducing income poverty and other social indicators?

Looking at the income poverty figures measured by the World Bank's $1.25/day Headcount Ratio for India, we find that it has fallen from 53.6% to 32.7% over the last two decades: a decrease of 0.95 percentage points per annum. This laudatory improvement, however, has been much slower than her neighbours with much lower growth in GNI per capita. Drèze and Sen (2011) powerfully demonstrate that India's progress in some of the other key indicators has also been slower than her neighbours, and we echo similar findings here. For example, the reduction in the Indian fertility rate parallels the reduction in average fertility rate in Sub-Saharan Africa, which is much slower than India's neighbours, Bangladesh, Nepal and Pakistan. India also has the lowest life expectancy rate – one of the components in the UNDP's famous Human Development Index (HDI) – compared to her South Asian neighbours. Bhutan and Nepal had much lower life expectancy at birth in 1990 than India, but their progress has been more than twice as high as that of India's. Even without overlooking India's tremendous progress in the under-five mortality rate, all neighbours except Pakistan have fared much better, and India's progress in DPT immunization rates among 12–23 month olds has been dismal even compared to the Sub-Saharan African countries. Table 2.1 also includes some key indicators on education and access to services which follow almost the same pattern.

Thus, India's performance in key social indicators has not been satisfactory if we compare her performance with South Asia. India's GNI per capita is nearly 1.9 times larger than that of Bangladesh and her income poverty is nearly 10% lower, but Bangladesh outsmarts India in every key social indicator, as Drèze and Sen (2011) pointed out. Another important observation from Table 2.1 is that in 1990, China's GNI per capita and $1.25/day headcount poverty was worse than India's, but in all other indicators, except access to safe drinking water in rural areas, China's performance already surpassed India's. And along with growth in income, China has improved these social indicators further to an envious degree.

Hence understanding progress only in terms of income growth is not sufficient. Distinct measures are required to ascertain whether rising national income translates into social gains. While discussing the prospects and policy challenges for the 12th five-year plan 2012–2017,

Ahluwalia (2011) acknowledges the need for Indian growth to be more inclusive in terms of improving child and maternal health, quality of education through access to basic services, and reducing disparity across social groups and states. Distinct measures are required, because income poverty does not necessarily coincide with deprivations in other social indicators. Franko *et al.* (2002) and Ruggeri Laderchi *et al.* (2003) found that more than 60% of adults who were illiterate and malnourished were not income poor. Yet viewing deprivations in each indicator separately does not allow us to distinguish those who are deprived in a single dimension from those who are deprived simultaneously in many dimensions. The multidimensional poverty measures applied below do just that.

Table 2.1: India's Performance in Income and Other Social Indicators

	Indicators	Year	India	Bangladesh	Bhutan	China	Nepal	Pakistan	Sri Lanka	Sub-Saharan Africa
Income	Gross National Income per Capita (in International $)	1990	860	550	1280	800	510	1220	1450	1092
		2011	3620	1940	5480	8450	1260	2880	5560	2251
		Growth (p.a.)	6.8%	5.9%	6.8%	11.3%	4.2%	4.0%	6.3%	3.3%
Income Poverty	$1.25/Day Headcount Ratio (%)	1985-89	53.6	66.7	..	54.0	78.2	66.5	20.0	..
		2007-10	32.7	43.3	10.2	13.1	24.8	21.0	7.0	..
		Change (p.a.)	*0.95*	*1.1*	..	*1.95*	*2.13*	*2.16*	*0.59*	..
Health	Fertility Rate (Births per Woman)	1990	3.9	4.5	5.8	2.3	5.2	6.0	2.5	6.3
		2010	2.6	2.2	2.4	1.6	2.7	3.4	2.3	4.9
		Change	*-1.3*	*-2.3*	*-3.4*	*-0.7*	*-2.5*	*-2.6*	*-0.2*	*-1.3*
	Life Expectancy at Birth (in Years)	1990	58.4	59.5	52.6	69.5	54.0	60.8	69.7	49.5
		2010	65.1	68.6	66.9	73.3	68.4	65.2	74.7	54.2
		Change	*6.8*	*9.2*	*14.3*	*3.8*	*14.4*	*4.4*	*5.0*	*4.6*
	Under-5 Mortality Rate (per 1000)	1990	114.2	138.8	138.4	48.9	134.6	122.2	28.9	177.2
		2011	61.3	46.0	53.7	14.6	48.0	72.0	12.2	108.3
		Change	*-52.9*	*-92.8*	*-84.7*	*-34.3*	*-86.6*	*-50.2*	*-16.7*	*-68.9*
	DPT Immunization Rate (Percentage of 12–23 Month Olds)	1990	70	69	96	97	43	54	86	57
		2010	72	95	91	99	82	88	99	77
		Change	*2*	*26*	*-5*	*2*	*39*	*34*	*13*	*20*
Education	Mean Years of Schooling (25 Years and Older)	1990	3.0	2.9	..	4.9	2.0	2.3	8.3	..
		2011	4.4	4.8	..	7.5	3.2	4.9	10.8	4.5
		Change	*1.4*	*1.9*	..	*2.7*	*1.2*	*2.6*	*2.5*	..
	Percentage of Adult Population with no Education	1990	51.6	55.5	..	22.2	65.8	66.2	10.3	..
		2010	32.7	31.9	..	6.5	37.2	38	7.2	..
		Change	*-18.9*	*-23.6*	..	*-15.7*	*-28.6*	*-28.2*	*-3.1*	..
Access to Facility	Rural Population with Access to Improved Sanitation Facility (%)	1990	7	34	..	15	7	7	67	19
		2010	23	55	29	56	27	34	93	23
		Change	*16*	*21*	..	*41*	*20*	*27*	*26*	*4*
	Rural Population with Access to Improved Water Source (%)	1990	63	75	..	56	74	81	62	35
		2010	90	80	94	85	88	89	90	49
		Change	*27*	*5*	..	*29*	*14*	*8*	*28*	*13*

Source: World Bank Data Online accessed on December 6, 2012 at **http://data.worldbank.org/indicator** and the UNDP's *Human Development Report* 2011. The table is inspired by Drèze and Sen (2011), with minor additions.

Analysing multiple dimensions of poverty requires the selection of an appropriate index. Various multidimensional indices of poverty have been proposed in the past ten years or so.[4] Given that almost all indicators of social deprivations are either binary or categorical, the counting approaches are best suited. An exploratory empirical illustration for measuring multidimensional poverty has been provided by Jayaraj and Subramanian (2009) using a counting class of social exclusion indices inspired by Chakravarty and D'Ambrosio (2006). Jayaraj and Subramanian identified eight dimensions from the first and third round of NFHS datasets and showed that multidimensional poverty decreased between 1992–93 and 2005–06. They further found that the already better-performing states had larger reductions in poverty, which supported the findings of Deaton and Drèze (2002). This study was extended recently by Mishra and Ray (2013) estimating multidimensional poverty using from the NFHS dataset and NSS datasets. Mishra and Ray find that the reduction in multidimensional poverty has been due to a major and steady reduction in poverty in rural areas.[5]

The Indian exercise provided by Jayaraj and Subramanian raises the issues clearly. This paper builds on theirs to conduct a more definitive and exhaustive analysis of multidimensional poverty. For our analysis in this paper, we use the Multidimensional Poverty Index reported in the UNDP's *Human Development Report* 2011 (UNDP 2011) for the purpose of international comparisons across countries. According to this international MPI, 53.7% of Indian people were living in households that were multidimensionally poor in 2005–06 and India's overall MPI value was 0.283 (UNDP 2011). We use an adaptation of this international index for our analysis in the same spirit as the World Bank's $1.25/day measure, while acknowledging that a different measure could be developed to reflect India's plans and goals more directly (Alkire and Seth 2013). The MPI is an adaptation of the methodology proposed by Alkire and Foster (2011), which has several useful properties that allow a deeper analysis of multidimensional poverty. Some studies have already used the MPI in the India context. For example, Alkire and Seth (2013) finds that the Indian states do not rank in a similar manner based in the MPI and income poverty. Implementing the MPI using data from three districts of Madhya Pradesh and Rajasthan, Alkire and Kumar (2012) find that of the 40-47% of households that are identified as multidimensionally poor or income poor, only 14% are poor by both income and multidimensional poverty measures. We outline the MPI methodology and its properties in the next section.

3. Methodology

The international MPI, which was developed by Alkire and Santos (2010, 2013) in collaboration with the UNDP and first appeared in the 2010 *Human Development Report*, is one particular adaptation of the adjusted headcount ratio (M_0) proposed in Alkire and Foster (2011). This section outlines the methodology and relevant properties that are used in the subsequent sections to understand the change in India's multidimensional poverty.

[4] Chakravarty *et al.* (1998), Tsui (2002), Bourguignon and Chakravarty (2003), Kakwani and Silber (2008), Asselin (2009), and Alkire and Foster (2011).

[5] For an application of the same method comparing multidimensional poverty between China and India, see Mishra and Ray (2012).

3.1. The Adjusted Headcount Ratio

Suppose at a particular point in time, there are n people in India and their wellbeing is evaluated by d indicators.[6] We denote the achievement of person i in indicator j by $x_{ij} \in \mathbb{R}$ for all $i = 1, \dots, n$ and $j = 1, \dots, d$. The achievements of n persons in d indicators are summarized by an $n \times d$ dimensional matrix X, where rows denote persons and columns denote indicators. Each indicator is assigned a weight based on the value of a deprivation relative to other deprivations. The relative weight attached to each indicator j is the same across all persons and is denoted by w_j, such that $w_j > 0$ and $\sum_{j=1}^{d} w_j = 1$.

For single-dimensional analysis, people are identified as poor as long as they fail to meet a threshold called the 'poverty line' and non-poor otherwise. In multidimensional analysis based on a counting approach – as with the adjusted headcount ratio – a person is identified as poor or non-poor in two steps. In the first step, a person is identified as deprived or not in each indicator subject to a deprivation cutoff. We denote the *deprivation cutoff* for indicator j by z_j and the deprivation cutoffs are summarized by vector z. Any person i is deprived in any indicator j if $x_{ij} < z_j$ and non-deprived, otherwise. We assign a *deprivation status score* g_{ij} to each person in each dimension based on the deprivation status. If person i is deprived in indicator j, then $g_{ij} = 1$; and $g_{ij} = 0$ otherwise. The second step uses the weighted deprivation status scores of each person in all d indicators to identify the person as poor or not. An overall *deprivation score* $c_i \in [0,1]$ is computed for each person by summing the deprivation status scores of all d indicators, each multiplied by their corresponding weights, such that $c_i = \sum_{j=1}^{d} w_j g_{ij}$. A person is identified as poor if $c_i \geq k$, where $k \in (0,1]$; and non-poor, otherwise.[7] The deprivation scores of all n persons are summarized by vector c.

After identifying the set of poor and their deprivation scores, we obtain the adjusted headcount ratio (M_0). The well-known *focus* axiom requires that while measuring poverty the focus should remain only on those identified as poor.[8] This entitles us to obtain the censored deprivation score vector $c(k)$ from c, such that $c_i(k) = c_i$ if $c_i \geq k$ and $c_i(k) = 0$, otherwise. Then, M_0 is equal to the average of the censored deprivation scores:

$$M_0 = \frac{1}{n} \sum_{j=1}^{d} c_i(k).$$

3.2. Properties of the Adjusted Headcount Ratio

We now outline some of the features of M_0 that are useful for analysis in the paper. The first is that M_0 can be expressed as a product of two components: the share of the population who are

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[6] The meaning of the terms 'dimension' and 'indicator' are slightly different in Alkire and Foster (2011) and in Alkire and Santos (2010). In Alkire and Foster (2011), no distinction is made between these two terms. In Alkire and Santos (2010), however, the term 'dimension' refers to a pillar of wellbeing and a dimension may consist of several indicators.

[7] For $k = 1$, the identification approach is referred to as the *intersection approach*; for $0 < k \leq \min_j\{w_1, \dots, w_d\}$, it is referred to as the *union approach* (Atkinson 2003); and for $\min_j\{w_1, \dots, w_d\} < k < 1$, it is referred to as the dual cutoff approach by Alkire and Foster, or more generally as the *intermediate approach*.

[8] In the multidimensional context, there are two types of focus axioms. One is deprivation focus, which requires that any increase in already non-deprived achievements should not affect a poverty measure. The other is poverty focus, which requires that any increase in the achievements of non-poor persons should not affect a poverty measure. See Bourguignon and Chakravarty (2003) and Alkire and Foster (2011).

multidimensionally poor or Multidimensional Headcount Ratio (H) and the average of the deprivation scores among the poor only (A). Technically:

$$M_0 = \frac{q}{n} \times \frac{1}{q} \sum_{j=1}^{d} c_i(k) = H \times A;$$

where q is the number of poor.[9] This feature has an interesting policy implication for inter-temporal analysis. A certain reduction in M_0 may occur either by reducing H or by reducing A. This difference cannot be understood by merely looking at M_0. If a reduction in M_0 occurs by merely reducing the number of people who are marginally poor, then H decreases but A may not. On the other hand, if a reduction in M_0 occurs by reducing the deprivation of the poorest of the poor, then A decreases, but H may not.[10]

The second feature of M_0 is that if the entire population is divided into m mutually exclusive and collectively exhaustive groups, then the overall M_0 can be expressed as a weighted average of the M_0 values of m subgroups, where weights are the respective population shares. We denote the achievement matrix, the population, and the adjusted headcount ratio of subgroup ℓ by X^{ℓ}, n^{ℓ}, and $M_0(X^{\ell})$, respectively. Then the overall M_0 can be expressed as:

$$M_0 = \sum_{\ell=1}^{m} \frac{n^{\ell}}{n} M_0(X^{\ell}).$$

This feature is also known as *subgroup decomposability* and is useful for understanding the contribution of different subgroups to the overall poverty.[11] Note that the contribution of a subgroup to the overall poverty depends both on the poverty level of that subgroup and that subgroup's population share.

The third feature of M_0 is that M_0 can be expressed as an average of the censored headcount ratios of indicators weighted by their relative weight. The Censored Headcount Ratio of an indicator is the proportion of the population that is multidimensionally poor and is simultaneously deprived in that indicator. Let us denote the Censored Headcount Ratio of indicator j by h_j. Then M_0 can be expressed as:

$$M_0 = \sum_{j=1}^{d} w_j h_j = \sum_{j=1}^{d} w_j \left[\frac{1}{n} \sum_{i=1}^{n} g_{ij}(k) \right];$$

Where $g_{ij}(k) = g_{ij}$ if $c_i \geq k$ and $g_{ij}(k) = 0$, otherwise. Similar relationships can be established between A and the deprivations among the poor. Let us denote the proportion of poor people deprived in indicator j by h_j^p. Then, dividing both sides of the above relationship by H, we find:

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[9] This feature is analogous to that of the Poverty Gap Ratio, which is similarly expressed as a product of the Headcount Ratio and the Average Income Gap Ratio among the poor.

[10] Apablaza and Yalonetzky (2011) has shown that the change in M_0 can be expressed as $\Delta M_0 = \Delta H + \Delta A + \Delta H \times \Delta A$, where Δx is referred to as change in x.

[11] See Foster, Greer, and Thorbecke (1984) for a discussion on this property.

$$A = \frac{M_0}{H} = \sum_{j=1}^{d} w_j \frac{h_j}{H} = \sum_{j=1}^{d} w_j h_j^p.$$

Breaking down poverty in this way allows an analysis of multidimensional poverty to depict clearly how different indicators contribute to poverty and how their contributions change over time. Let us denote the contribution of indicator j to M_0 by ϕ_j. Then, the contribution of indicator j to M_0 is:

$$\phi_j = w_j \frac{h_j}{M_0} = w_j \frac{h_j^p}{A}.$$

3.3. The Multidimensional Poverty Index (MPI)

The international MPI is an adaptation of M_0 with a particular choice of indicators, deprivation cutoffs and relative weights, and a poverty cutoff. The international MPI is based on ten indicators grouped into three dimensions reported in Table 3.1. The first column reports three dimensions: health, education and standard of living. The second column reports the ten indicators. Each dimension is equally weighted and indicators within each dimension are also equally weighted. The third column reports the deprivation cutoff of each of the ten indicators. The deprivation cutoffs are applied at the household level and thus refer to all members within the household. A household is identified as MPI poor if its deprivation score is larger than or equal to $k = 1/3$. Thus, MPI pursues an intermediate approach to the identification of the poor as discussed in Footnote 7. Being an adaptation of M_0, the MPI can be expressed as $\text{MPI} = H \times A$, where H is referred to as the *incidence of poverty* and A as the *intensity of poverty*. Moreover, the MPI inherits all features of M_0 as outlined in Section 3.2.

Table 3.1: Dimensions, Indicators, Deprivation Cutoffs and Weights of the International MPI

Dimension (Weight)	Indicator (Weight)	Deprivation Cutoff
Education (1/3)	Schooling (1/6)	No household member has completed five years of schooling
	Attendance (1/6)	Any school-aged child in the household is not attending school up to class 8[12]
Health (1/3)	Nutrition (1/6)	Any woman or child in the household with nutritional information is undernourished[13]
	Mortality (1/6)	Any child has passed away in the household[14]
Standard of Living (1/3)	Electricity (1/18)	The household has no electricity
	Sanitation (1/18)	The household's sanitation facility is not improved or it is shared with other households
	Water (1/18)	The household does not have access to safe drinking water or safe water is more than a 30-minute walk (round trip)
	Flooring material (1/18)	The household has a dirt, sand or dung floor
	Cooking fuel (1/18)	The household cooks with dung, wood or charcoal
	Assets (1/18)	The household does not own more than one of: radio, telephone, TV, bike, motorbike or refrigerator; and does not own a car or truck

Source: Alkire, Roche, Santos, and Seth (2011)

12 If a household has no school-aged children, the household is treated as non-deprived.

13 A woman with BMI below 18.5 m/kg^2 is considered undernourished. A child is considered undernourished if the body weight, adjusted for age, is more than two standard deviations below the median of the reference population.

14 If no woman in a household has been asked this information, the household is treated to be non-deprived.

4. An Almost MPI for Inter-Temporal Analysis

Although we try to replicate the international MPI indicators as closely as possible, our selection is affected by the second round of NFHS dataset used in this analysis. We first describe the datasets and major differences between them. We then elaborate on the necessary amendments required in the MPI indicators, which were outlined in Table 3.1, in order to obtain comparable results across time. In this paper, we refer to the amended version of the international MPI used to analyse inter-temporal poverty in India as MPI-I.

4.1. Data for Analysis

For our analysis, we use the second and the third round of NFHS datasets for years 1998/99 (NFHS2) and 2005/06 (NFHS3), respectively. We would have preferred to also use the first NFHS dataset for analysis, but no nutritional information was collected in that survey. Thus, we face a trade-off between not being able to use any nutritional information and being able to use the information on the rest of the indicators for an additional point in time. Given that under-nutrition is a major concern in the Indian context, we have decided to use the nutritional information. The NFHS2 and the NFHS3 are both representative nationally and across 28 states and the union territory of Delhi.[15] The samples were collected through a multi-stage, stratified sampling procedure. The NFHS2 and the NFHS3 datasets contain information for 92,486 and 109,041 sample households, respectively.[16]

Although these two datasets are similar in many aspects, there are five major differences that require consideration. The **first** difference is the duration over which samples were collected. Samples in NFHS3 were collected between November 2005 and August 2006; whereas in NFHS2, they were collected between November 1998 and July 2000.[17] However, 99.3% of the Indian population in the NFHS2 were sampled between November 1998 and August 1999.[18] Apparently, there is no significant loss of comparability due to this first difference alone, but the next four differences require explicit adjustments in the datasets. The **second** difference is that, both women in the age group of 15–49 years and men in the age group of 15–54 were interviewed in NFHS3; whereas, in NFHS2, no men but only ever married women in the age group of 15–49 years were interviewed. The **third** difference is that in NFHS3, anthropometric information was collected for all children under the age of five years in the interviewed

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15 The other alternative dataset for this analysis would have been the National Sample Survey data collected by the Ministry of Statistics, Government of India. The quinquennial surveys on 'consumption expenditures' and 'employment and unemployment' are large and collect information from between 100,000 and 130,000 sample households, but information on all dimensions is not available from each survey unlike in the NFHS. The consumer expenditure survey collects information on detailed consumption expenditure, but not enough information on education; whereas the employment and unemployment survey collects information on education and labour market participation, but not enough information on standard-of-living or health indicators. Moreover, none of these surveys collects any anthropometric information. As an alternative, one may suggest using the information on average nutritional intake of each household which is expected to affect anthropometric outcome. However, this indicator is difficult to justify: being non-deprived on average nutritional intake does not ensure that nutrition has been distributed equally within the household, nor that there is no under-nutrition in those households (see, for example, Haddad and Kanbur 1990). We instead prefer to use the direct anthropometric information on women and children available in the NFHS.

16 Note that the NFHS datasets are not representative of the homeless population or those who live on alms. Also, they lack anthropometric information for anyone from the households with no women in the 15–49 age group.

17 In NFHS2, samples covering 80.5% of the Indian population were collected in 1999; and in NFHS3, samples covering 92.6% of the population were collected in 2006. So, we take 1999 and 2006 as our reference years for inter-temporal comparison.

18 Samples in Tripura were collected between May 2000 and July 2000. For Meghalaya and Nagaland, samples were collected between May 1999 and January 2000. For Jammu and Kashmir and Karnataka, 3.7% and 0.4% of the samples were collected in September 1999, respectively. Thus, precautions should be taken when drawing any conclusions based on the inter-temporal comparison of Meghalaya, Nagaland and Tripura. The margin of error in comparison should be much lower for Jammu Kashmir and Karnataka.

households; whereas, in NFHS2, anthropometric information was collected for all children under the age of three years living with their mother in the interviewed households. **Fourth**, in NFHS3, the school attendance information was collected for children who were five years or older; whereas, in NFHS2 school attendance information was collected for children who were six years and older. Moreover, in NFHS3, it was specifically asked if a child had attended school anytime in the academic term 2005–06; whereas in NFHS2, it was simply asked if a child was still in school irrespective of any particular academic term. **Fifth**, unlike in NFHS3, NFHS2 collected no information about the floor materials of the houses. Thus, in order to have robust comparisons of multidimensional poverty across two periods, adjustments are required in certain MPI indicators.

4.2. Comparable Indicators across Time

Out of the ten indicators listed in Table 3.1, six are identical to the international MPI, but four indicators require adjustments due to the differences in the two NFHS datasets: nutrition, mortality, school attendance, and flooring material. We refer to the deprivation cutoffs in Table 4.1 as the MPI-I cutoffs. Differences in these four indicators cause the MPI-I to appear lower than the international MPI, but in fact the international MPI is more accurate because it uses richer information which has been dropped from the MPI-I in order to create comparability.

The nutrition indicator in the NFHS3 dataset has been adjusted to match the information available in the NFHS2 dataset. Unlike the international MPI, we identify as deprived in nutrition those who live in a household having at least one ever married woman or having any child less than three years being under-nourished. For the international MPI, the households from which no women were interviewed and no anthropometric information for children under the age of five years was collected were assumed to be non-deprived. For the MPI-I, we additionally assume that the households from which no ever married women were interviewed and no anthropometric information for children under the age of five years was collected are non-deprived. This identifies a smaller proportion of the population as deprived in nutrition.

The next indicator requiring adjustment is mortality. Two adjustments have been made with this indicator. First, for the international MPI, child mortality information was collected both from the interviewed women and men. However, in order to match the information available in NFHS2, the information on child mortality in NFHS3 is restricted to ever married women only. Second, by child mortality in this paper, we consider under-five mortality, following the definition of child mortality in the fourth Millennium Development Goal instead of the death of any child of any age as in the international MPI. Consequently, this indicator also identifies a slightly smaller proportion of the population as deprived compared to the international MPI.

The fourth difference between the two datasets necessitates certain adjustments in the attendance indicator. In NFHS3, it was asked if a child had attended school sometime in the 2005–06 academic year; whereas, in NFHS2, it was asked if the member was still in school during the interview. These two questions are not comparable mainly because the period of the survey does not coincide with any particular academic year. The academic year, as assumed in NFHS3 begins in April of a year (IIPS 2007, p. 31) and the interviews were conducted between November and August of the following year for both NFHS2 and NFHS3. Before April 1999, a six-year-old child could have been attending during the 1998–99 academic year; whereas in or after April 1999, a six-year-old child could have been attending during the academic year 1999–2000. In NFHS3, however, it was specifically asked if a child had attended school in the 2005–06 academic year.

Table 4.1: Dimensions, Indicators, Deprivation Cutoffs and Weights of the MPI-I

Dimension (Weight)	**Indicator (Weight)**	**Deprivation Cutoff**
Education (1/3)	Schooling (1/6)	No household member has completed five years of schooling
	Attendance (1/6)	Any school-aged child (6–14) in the household is not attending school in the academic year of study[19]
Health (1/3)	Nutrition (1/6)	Any ever married woman with a BMI lower than 18.5 Kg/m^2 or any child under the age of thirty-six months having z-score lower than -2SD from the mean z-score
	Mortality (1/6)	Any child under the age of five of an ever married woman has died in the household
Standard of Living (1/3)	Electricity (1/18)	The household has no access to electricity
	Sanitation (1/18)	The household's sanitation facility is not improved or it is shared with other households
	Water (1/18)	The household does not have access to safe drinking water or safe water is more than a 30-minute walk (round trip)
	Housing (1/18)	The household lives in a kaccha house; or lives in a semi-pucca house and owns less than five acres of unirrigated or 2.5 acres of irrigated land
	Cooking fuel (1/18)	The household mainly cooks with charcoal, crop residue, animal dung, wood, or straw/shrubs/grass
	Assets (1/18)	The household does not own more than one of: radio, TV, telephone, bike, motorbike or refrigerator, and does not own a car or truck

Thus, for a household that was interviewed in or after April 2006, a six-year-old child may well have been attending school in academic year 2006–07, but reported not attending school in the 2005–06 academic year. Note that the issue of incomparability arises mainly for children who are six years old. In order to preserve comparability, we simply do not consider the attendance information of the six-year-old children who were interviewed in or after April in both surveys.[20]

The final indicator requiring adjustment is flooring. In the international MPI, flooring has been used as an indicator and a household is identified as deprived if the floor of the house is made of low-quality materials such as dirt, sand or dung. However, unlike in NFHS3, no specific information was collected on the floor, wall and roof materials of the houses in NFHS2. Instead, both surveys collected information on the type of house where households reside. The type of house is divided into three categories: kaccha, semi-pucca and pucca. The pucca houses are entirely built with high-quality materials; the semi-pucca houses are built with partly high- quality materials and partly low-quality materials; and the kaccha houses are built with low-quality materials throughout. In place of 'flooring material' in the international MPI, we consider a somewhat related indicator that uses information on the ownership of land in addition to the type of house so that a similar proportion of population is identified as deprived.[21] We identify all households living in kaccha houses as deprived. In addition, we identify those households as deprived that live in semi-pucca houses, unless they own five acres or more of unirrigated land or 2.5 acres or more acres of irrigated land.[22] When this housing indicator is crossed with the

[19] For NFHS2, the academic year we consider is 1998/99. For NFHS3, the academic year we consider is 2005/06.

[20] The adjustment in the attendance indicator does not solve the issue of incomparability altogether because in rural areas, children tend to be admitted in schools late. So, the children at the age of seven or eight from the households interviewed in or after April 2006 may have been attending schools in academic year 2006–07, but reported not attending in academic year 2005–06. This may cause the attendance indicator to over-estimate deprivation in this indicator to some extent in 2006 compared to 1999.

[21] An alternative indicator could have been the type of house irrespective of any land ownership information and identify all households living in either kaccha or semi-pucca houses as deprived. However, this alternative indicator identifies more than 55% of the population as a deprived, which is much larger than the nearly 48% of the population identified as deprived based on the type of floor material in NFHS3.

[22] Similar criteria have been used by the Indian government to exclude households from being interviewed for receiving Below the Poverty Line (BPL) cards (GoI 2011).

flooring indicator using NFHS-3, both indicators identify 43% of people as deprived by either indicator and 46% as non-deprived by either indicator. They disagree regarding the deprivation status of the remaining 11% of people.

The above adjustments in four indicators make both datasets comparable across the two time periods, enabling us to analyse trends rigorously.

5. National Performance

Based on the comparable indicators, did the overall situation of the poor in India improve between 1999 and 2006? The answer is yes. First, looking at the indicators separately, we find that India's performance in every indicator has improved, as Table 5.1 shows. The first column of Table 5.1 lists ten indicators. The next three columns report the proportion of population who are deprived in each indicator for year 1999 and their lower and upper bounds for the 95% confidence intervals. The following three columns report the same for year 2006. The final column on the right shows the absolute changes in deprivation and whether these changes are statistically significant.

We find from Table 5.1 that the largest absolute reductions have taken place in some standard-of-living indicators. The percentages of people living in households deprived in 'housing' and 'sanitation' have gone down by more than 11%. Deprivations in 'electricity', 'water' and 'assets' have also been reduced by more than 6%. The percentage of people living in households using solid fuels for cooking purposes has gone down just 2% but is statistically significant. In 1999, 76.3% people were living in households deprived in 'cooking fuel'. The number has only decreased by 2.3 percentage points. India's reduction of health and education deprivations has been slower than all standard-of-living indicators except cooking fuel. Over the seven-year period, the percentage of people living in households that are deprived in the 'schooling' indicator – or the households with no adult member (over the age of 15) finishing five years of schooling – merely decreased from 21.8% to 18.3%. The 'attendance' indicator showed a statistically insignificant reduction of 1.2 percentage points.[23] India's performance in health was slightly better than the education indicators. Deprivation in the 'nutrition' indicator fell by 4 percentage points from 40.8% and the 'mortality' indicator fell by 3.8 percentage points from 25.4%. The final column of Table 5.1 reports the changes relative to the percentage deprived in 1999. The rates of change across dimensions are more even. The relative changes in the health and education indicators range from 5.8 percent in 'attendance' to 15.9 percent in 'schooling'. The relative changes in the standard of living indicators range from 3 percent in cooking fuel to 18.8 percent in housing and 32.1 percent in water. Changes in water, housing and electricity indicators are larger than the reductions in health and education indicators both in an absolute as well as a relative sense. Among health and nutrition, the highest absolute reduction occurs in nutrition and child mortality, whereas the highest relative reduction is in schooling and child mortality.

[23] In the previous section, we noted that two different questions were asked in NFHS2 and NFHS3 while collecting the school attendance information. Consequently, in 2006, the attendance rate of six-year-old children was notably lower than in 1999. The attendance rate among seven-year-old and eight-year-old children was also lower in 2005, but by a smaller margin. A potential reason may be that children in rural areas tend to start attending schools at a relatively older age. However, the attendance rate among children in the age group of 9–14 years increased by more than 5% between 1999 and 2006. The enrolment rate and attendance rate in the late 1990s and early 2000 had improved following the first and second rounds of the NFHS datasets (not the third round used in this paper) and the NSS datasets, respectively (see Kingdon 2007 and Sankar 2007). To our surprise, however, using a different definition of attendance rate, the 2011 Annual Status of Education Report finds that attendance rates have not improved between 2005 and 2011 (Pratham 2012).

Table 5.1: Change in Deprivations in Ten Indicators between 1999 and 2006[24]

Indicator	1999		2006		Absolute Change[25]	Percentage Change
	% Deprived	Confidence Interval (95%)	% Deprived	Confidence Interval (95%)		
Schooling	21.8%	(21.3%, 22.3%)	18.3%	(17.7%, 19.0%)	-3.5% *	-15.9%
Attendance	20.0%	(19.5%, 20.5%)	18.8%	(18.2%, 19.5%)	-1.2%	-5.8%
Mortality	25.4%	(24.9%, 25.8%)	21.6%	(21.1%, 22.1%)	-3.8% *	-14.9%
Nutrition	40.8%	(40.2%, 41.3%)	36.8%	(36.2%, 37.4%)	-4.0% *	-9.8%
Electricity	39.2%	(38.4%, 40.0%)	32.8%	(31.8%, 33.8%)	-6.3% *	-16.2%
Sanitation	81.1%	(80.3%, 81.9%)	69.8%	(68.9%, 70.7%)	-11.3% *	-14.0%
Water	23.2%	(22.3%, 24.2%)	15.8%	(14.9%, 16.6%)	-7.4% *	-32.1%
Housing	59.5%	(58.6%, 60.3%)	48.3%	(47.4%, 49.2%)	-11.2% *	-18.8%
Cooking Fuel	76.3%	(75.6%, 77.1%)	74.0%	(73.2%, 74.9%)	-2.3% *	-3.0%
Assets	55.3%	(54.6%, 56.0%)	48.7%	(47.9%, 49.5%)	-6.6% *	-11.8%

Table 5.1 explains how the deprivations in different indicators have changed over time. Let us now see how multidimensional poverty has changed over time. Table 5.2 reports the adjusted headcount ratio (M_0) and its two components – the multidimensional headcount ratio (H) and the average intensity among the poor (A) – when the poverty cutoff is equal to one third of all weighted indicators (or $k = 1/3$). Note that M_0 is equal to the MPI-I. Table 5.2 shows that there has been a statistically significant reduction in M_0 between 1999 and 2006. The M_0 decreased from 0.3 in 1999 to 0.251 in 2006, by 2.4% per annum. Breaking it down, we find that the reduction has been due mainly to a statistically significant reduction in H. Although the fall in A was also statistically significant, the magnitude has been much smaller.

Table 5.2: The Change in Multidimensional Poverty between 1999 and 2006

Poverty Cutoff (k)	Indices	1999		2006		Change
		Values	Confidence Interval (95%)	Values	Confidence Interval (95%)	
One-third (1/3)	M_0	0.300	(0.296, 0.305)	0.251	(0.245, 0.256)	-0.050 *
	H	56.8%	(56.1%, 57.5%)	48.5%	(47.7%, 49.3%)	-8.3% *
	A	52.9%	(52.6%, 53.1%)	51.7%	(51.3%, 52.1%)	-1.2% *

Overall, India has reduced the proportion of multidimensionally poor who are deprived in one-third of all weighted indicators by 8.3% between 1999 and 2006 or by 1.2 percentage points per annum. The annual rate of reduction in H is slightly larger than the annual rate of reduction in the $1.25/day headcount ratio, which fell from 49.4% to 41.6% between 1994 and 2005 by 0.71 percentage points per annum.[26]

Knowing that multidimensional poverty has fallen nationally, it is of interest to explore the composition of poverty. We have already noted in Table 5.1 that the reductions in all ten

[24] Note that as a consequence of rounding the numbers to the nearest possible decimals, there may remain some discrepancies in reported numbers. This is applicable to the reported figures in subsequent tables in the paper.

[25] If a change is statistically significant, then it is denoted by '*'. The statistically significant changes are also denoted by '*' in the subsequent tables. We consider a reduction as statistically significant if the lower bound of the 1999 estimate is not lower than the upper bound of the respective 2005 estimate.

[26] In order to check the robustness of the change in poverty to weights across dimensions, we also have also computed the figures for four alternative weighting structures. The first alternative attaches a 50% weight to the education dimension and distributes 25% across each other dimension. The second alternative similarly attaches a 50% weight to health, and the third attaches a 50% weight to the standard-of-living dimension. The fourth alternative weights each of the ten indicators equally. We find that the Adjusted Headcount Ratios for all four alternative weighting structures have fallen between 2.3–2.5% per annum. Similarly, the multidimensional headcount ratios have fallen between 0.8–1.4 percentage points.

indicators have not been uniform. A legitimate question is thus: Has the composition of deprivations changed across time? This question can be answered by looking at the contribution of each of the ten indicators to overall M_0. Table 5.3 presents the contribution of all ten indicators to overall poverty. The left column lists all ten indicators. The next three columns report the censored headcount ratios in 1999 and 2006 and the changes across the two periods. The censored headcount ratio represents the proportion of the population residing in households that are simultaneously multidimensionally poor and are deprived in that indicator. By definition, the weighted average of the censored headcount ratios is equal to the adjusted headcount ratio. The fall in censored headcount ratios was statistically significant for all ten indicators.

Table 5.3: Change in the Contribution of Indicators to the Overall Poverty

	Censored Headcount Ratio				% of MPI Poor Deprived in Indicator			Contribution		
Indicator	**1999**	**2006**	**Absolute Change**[27]	**Percentage Change**	**1999**	**2006**	**Change**	**1999**	**2006**	**Change**
Schooling	21.1%	17.6%	-3.5%	-16.7%	37.2%	36.3%	-	11.7%	11.7%	-
Attendance	19.0%	17.2%	-1.9%	-9.9%	33.5%	35.4%	+	10.6%	11.4%	+
Mortality	22.5%	18.4%	-4.1%	-18.2%	39.6%	37.9%	-	12.5%	12.2%	-
Nutrition	35.4%	30.6%	-4.9%	-13.7%	62.4%	63.1%	+	19.7%	20.3%	+
Electricity	32.8%	26.8%	-6.0%	-18.4%	57.8%	55.3%	-	6.1%	5.9%	-
Sanitation	54.5%	44.3%	-10.2%	-18.7%	96.0%	91.4%	-	10.1%	9.8%	-
Water	17.6%	11.1%	-6.5%	-37.0%	31.0%	22.9%	-	3.3%	2.5%	-
Housing	44.6%	35.8%	-8.9%	-19.9%	78.6%	73.8%	-	8.3%	7.9%	-
Cooking Fuel	54.2%	46.7%	-7.4%	-13.7%	95.4%	96.4%	+	10.0%	10.4%	+
Assets	42.6%	35.2%	-7.4%	-17.4%	74.9%	72.5%	-	7.9%	7.8%	-

Note that the reductions in the censored headcount ratios do not necessarily replicate the reduction patterns in the reduction in the 'raw' deprivations reported in Table 5.1. The reduction in 'schooling' is almost the same for both, whereas the reduction in the censored headcount ratio is larger for 'attendance', 'mortality', 'nutrition' , 'cooking fuel', and 'assets' and is smaller for the rest. Note that there has not been any significant reduction in deprivation in the 'attendance' indicator in Table 5.1 – indeed its contribution increased the most of any indicator – but its reduction in terms of the censored headcount ratio is significant. This has been caused partly because of a much larger reduction in the multidimensional headcount ratio and merits clarification. The relative changes in corresponding censored headcount ratios are slightly larger than the 'raw' headcount ratios. The relative changes in the censored headcount ratios in 'electricity', 'water', 'housing' and also 'sanitation', are larger than the changes of any health and education indicators. As in the case of the raw headcounts, the absolute reduction of nutrition and mortality exceed those of education indicators, whereas relative reductions are strongest in mortality and schooling.

The story can be further explained by interpreting the censored headcount ratios with respect to the percentage of people who are poor. For this reason, in the middle three columns, we show how the deprivation profile of each indicator has changed among the poor only (that is, we divide the censored headcount by the percentage of poor people). For example, 37.2% of the multidimensionally poor in 1999 are deprived in 'schooling'; and in 2005, 36.3% of the poor remain deprived in this indicator. If we look at 'attendance', 'nutrition', and 'cooking fuel', we find that, in each case, deprivations among the poor have increased. On the other hand, the

[27] All changes are statistically significant at the 5% critical value.

indicators that have registered larger reductions in Table 5.1 also registered larger reductions in deprivations among the poor. In the final three columns, we report the (weighted) contribution of indicators to overall poverty. Note that the three indicators with the highest censored headcounts among the poor also show larger contributions to the overall poverty, as do those indicators carrying larger weights.

To summarize, India's significant reduction in multidimensional poverty has been accompanied by larger reductions in the censored headcount ratios of the standard-of-living indicators, each of which fell by 6–10%. In contrast, the censored headcount ratios of the health and education indicators fell by merely 1.9 to 4.9%. Hence, again in this high-resolution analysis we see that India's reduction of health and educational deprivations has been quite sluggish, even in comparison with her reduction of non-monetary, standard-of-living indicators.

6. Performance across Population Subgroups

Understanding the change in poverty and its composition at the national level is not enough. India is a gigantic country with diverse population subgroups, and it is imperative to enquire if the change has been shared uniformly across subgroups. The major population subgroups in which we are going to divide the Indian population are states, rural and urban areas, castes and religious groups. We also combine some of these different subgroups.

6.1. Performance across Geographic Regions

First, we consider India's performance across two geographic classifications: across rural and urban areas and across states.[28] The results are reported in Table 6.2. The left column lists the population subgroups. The next four columns report the population share, adjusted headcount ratio (M_0), multidimensional headcount ratio (H) and average deprivation shares among the poor (A) of these subgroups in 1999. The next four columns to the right report the same statistics in 2006. The final four columns report the changes over time and whether these changes have been statistically significant.

Both M_0 and H in rural and urban areas register statistically significant reductions. Quite satisfactorily, rural areas as a whole have registered larger reductions in both H and A and thus a considerably larger reduction in M_0. However, note that the urban population share has increased by nearly 4% across this period. It is difficult to argue that the birth rates among people in urban areas have been so much higher than in rural areas; rather this also likely includes rural-urban migration, including, it might seem, some of the poor. Now, looking at the changes in the average deprivation share or intensity, we find that the rural average deprivation share has decreased by 1.3 percentage points in comparison to a mere 0.5 percentage point for urban areas. The possible explanation may be that the poorer population from rural areas migrated to urban areas for a possible change in fortune, thus reducing the apparent rate of poverty reduction in urban areas.

Although the urban-rural disparity in multidimensional poverty has gone down, we should mention that the urban-rural difference in multidimensional poverty is still much larger than the urban-rural difference in income poverty. The Government of India's "Report of the Expert Group to Review the Methodology for Estimation of Poverty" (2009) provides geographic

[28] We report the poverty figures for urban and rural decomposition across states in the Appendix.

estimates of poverty for 1993–94 and 2004–05. In 1993–94, the income poverty headcount ratios of rural and urban areas were 50.1 and 31.8%, respectively; the rural-urban difference was only 18.3%. Poverty in both areas fell with rural poverty falling slightly faster (by 8.3%) than urban poverty (which fell by 6.1%). As a result, the difference between the rural and urban headcount ratios shrank to 16.1% in 2004–05, which is much smaller than the difference for the multidimensional headcount ratio (40.3%). This smaller difference may reflect the use of different price indices. Studies by Deaton and Drèze (2002) and Sen and Himanshu (2004), however, concluded that the urban-rural disparities increased during late 1990s.

Table 6.1: Performance across Geographic Subgroups

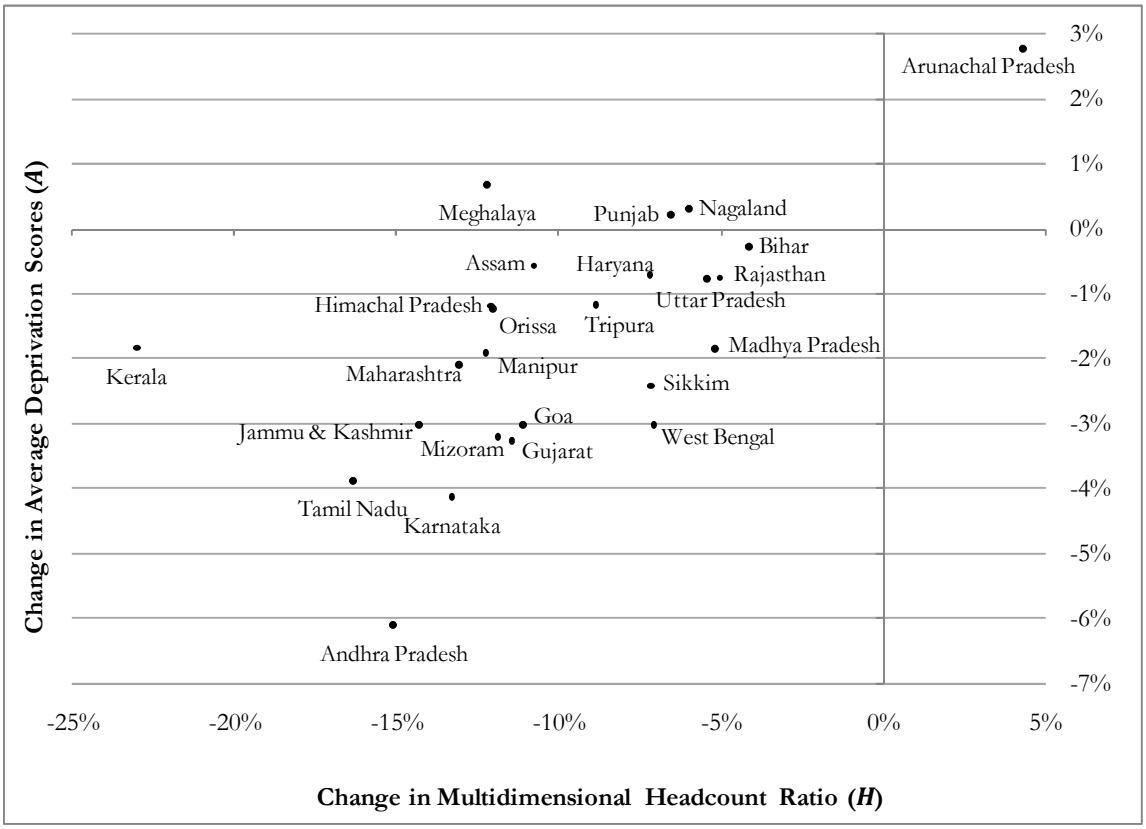
	1999				2006				Change	
Rural/Urban	**Pop. Share**	M_0	H	A	**Pop. Share**	M_0	H	A	M_0	H
Rural	73.3%	0.368	68.6%	53.6%	69.4%	0.319	60.8%	52.4%	-0.049*	-7.8%*
Urban	26.7%	0.116	24.4%	47.4%	30.6%	0.096	20.5%	46.9%	-0.020*	-4.0%*
States										
Andhra Pradesh	8.3%	0.299	56.7%	52.7%	7.1%	0.194	41.6%	46.6%	-0.105*	-15.1%*
Arunachal Pradesh	0.1%	0.226	47.2%	47.8%	0.1%	0.260	51.5%	50.6%	0.035	4.3%
Assam	2.5%	0.345	65.7%	52.5%	2.7%	0.285	54.9%	51.9%	-0.060*	-10.8%*
Bihar	10.4%	0.442	76.1%	58.1%	10.7%	0.416	72.0%	57.8%	-0.026	-4.1%
Goa	0.1%	0.112	24.4%	45.8%	0.1%	0.057	13.2%	42.8%	-0.055*	-11.1%*
Gujarat	4.9%	0.248	47.9%	51.8%	4.9%	0.175	36.0%	48.6%	-0.073*	-11.9%*
Haryana	2.1%	0.190	40.3%	47.2%	1.9%	0.154	33.1%	46.5%	-0.036	-7.2%
Himachal Pradesh	0.6%	0.154	36.3%	42.4%	0.6%	0.100	24.3%	41.2%	-0.054*	-12.0%*
Jammu & Kashmir	0.9%	0.226	46.0%	49.2%	0.9%	0.146	31.7%	46.2%	-0.080*	-14.3%*
Karnataka	5.3%	0.255	50.8%	50.3%	5.5%	0.173	37.5%	46.2%	-0.082*	-13.3%*
Kerala	3.3%	0.136	32.6%	41.7%	2.6%	0.038	9.5%	39.9%	-0.098*	-23.0%*
Madhya Pradesh	8.3%	0.368	67.6%	54.5%	8.7%	0.329	62.4%	52.6%	-0.040*	-5.2%*
Maharashtra	9.7%	0.226	46.0%	49.1%	9.2%	0.155	32.9%	47.0%	-0.071*	-13.1%*
Manipur	0.2%	0.212	44.6%	47.6%	0.2%	0.148	32.4%	45.7%	-0.065*	-12.2%*
Meghalaya	0.2%	0.358	67.4%	53.2%	0.3%	0.297	55.2%	53.9%	-0.061	-12.2%*
Mizoram	0.1%	0.155	32.6%	47.5%	0.1%	0.094	21.1%	44.2%	-0.061*	-11.5%*
Nagaland	0.2%	0.246	50.4%	48.8%	0.1%	0.218	44.4%	49.1%	-0.028	-6.0%
Orissa	3.8%	0.381	70.8%	53.8%	3.7%	0.309	58.7%	52.6%	-0.072*	-12.1%*
Punjab	2.4%	0.117	25.7%	45.6%	2.5%	0.088	19.2%	45.8%	-0.029*	-6.5%*
Rajasthan	5.3%	0.341	63.5%	53.7%	5.9%	0.310	58.5%	53.0%	-0.031	-5.0%
Sikkim	0.0%	0.173	36.1%	48.0%	0.1%	0.132	28.9%	45.6%	-0.041	-7.2%
Tamil Nadu	6.6%	0.195	42.8%	45.6%	5.4%	0.110	26.4%	41.7%	-0.085*	-16.4%*
Tripura	0.4%	0.276	55.5%	49.7%	0.3%	0.226	46.6%	48.6%	-0.049	-8.9%
Uttar Pradesh	14.7%	0.348	64.9%	53.6%	17.2%	0.314	59.5%	52.8%	-0.034*	-5.4%*
West Bengal	8.3%	0.339	60.8%	55.7%	7.9%	0.283	53.8%	52.6%	-0.055*	-7.1%*

Like urban and rural areas, not all states have shown similar progress. We have divided the Indian population across 25 states.[29] Multidimensional poverty appears to have fallen in all states except Arunachal Pradesh and the reduction in both M_0 and H was statistically significant for 17 states. Among statistically significant changes, the reduction in H has been steepest for Kerala, while the reduction in M_0 has been largest for Andhra Pradesh, because Andhra Pradesh also

[29] We have combined Bihar with Jharkhand, Madhya Pradesh with Chhattisgarh, and Uttar Pradesh with Uttarakhand because these states were not partitioned in 1999. We have not reported the union capital territory of Delhi, but it was included when calculating the national results.

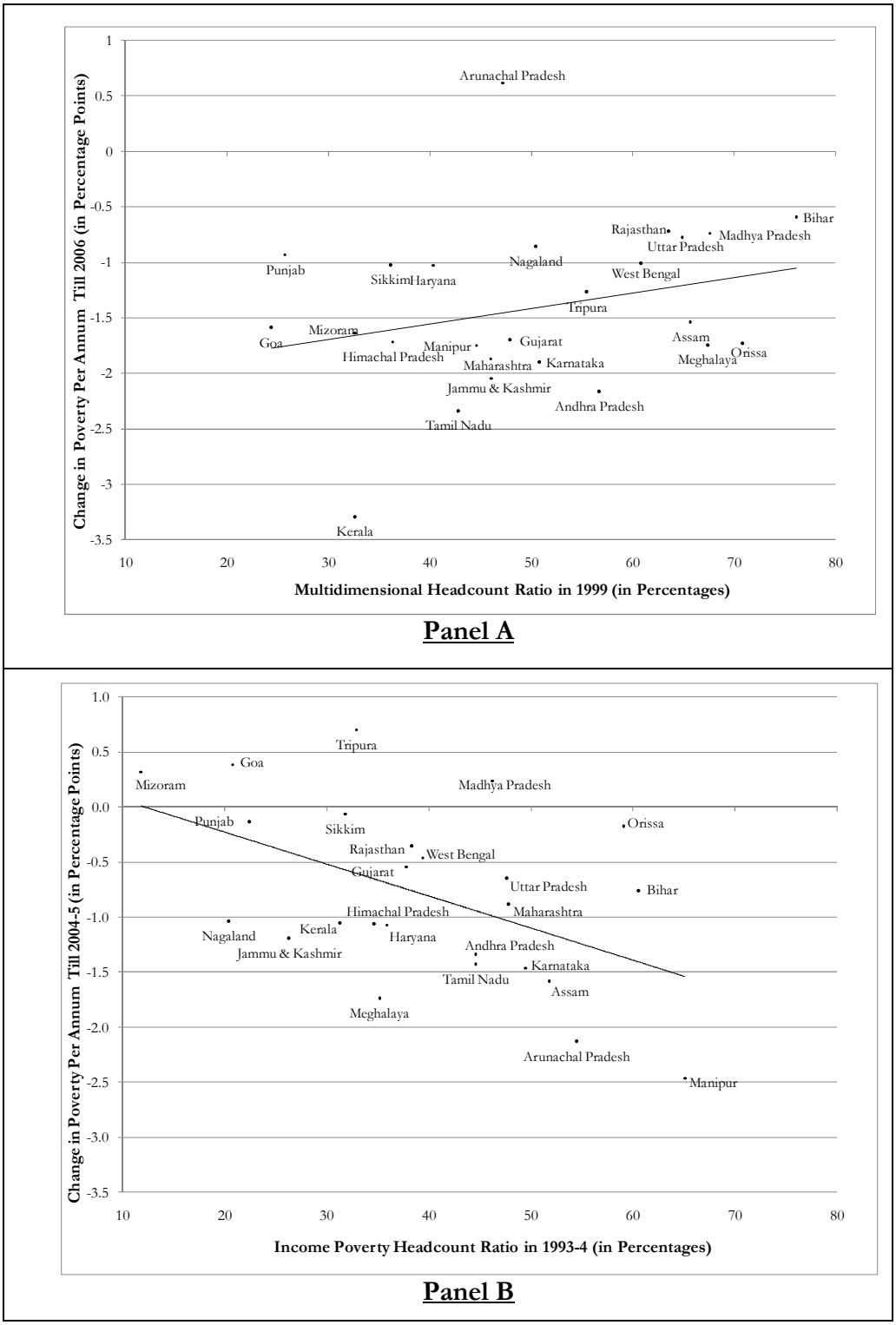
reduced A by 6.1%. Similarly, among statistically significant changes, Madhya Pradesh reduced H the least, while Punjab reduced M_0 the least because there has been no improvement in Punjab's A. None of the so-called BIMARU states and West Bengal, which together had more than 60% of the poor in 1999, had reduced poverty steeply by 2006. West Bengal, the least poor among them in 1999, had the largest reduction – 7.2 percentage points. In contrast, the four South-Indian states – Andhra Pradesh, Karnataka, Kerala, and Tamil Nadu – have reduced H by more than 13 percentage points and M_0 by 0.08 point, which is much larger than the national average reduction of 0.05 points. Both West Indian states – Gujarat and Maharashtra – also performed well by reducing H by 11.9 and 13.1 percentage points and M_0 by more than 0.07 of a point. Among the states which had an H above 65% in 1999, Assam, Meghalaya, and Orissa have reduced both M_0 and A more than the national average. By contrast, the second least-poor state in 1999 – Punjab – reduced H by 6.1% but M_0 only by 0.029 of a point because of its stagnant A.

Figure 6.1: State-wise Reduction in Multidimensional Headcount Ratio and Average Intensity among the Poor



Note that rankings of states by M_0 and by H are not necessarily the same mainly because of differences in A. Some countries have reduced M_0 by mostly reducing H; whereas, others have reduced M_0 by also reducing A. Figure 6.1 plots the change in H on the horizontal axis and the change in A on the vertical axis. The figure shows that Andhra Pradesh has reduced M_0 by reducing A relatively more than H; whereas Kerala has reduced M_0 by reducing H more than A. Tamil Nadu has reduced both H and A in a balanced manner. Punjab and Nagaland, on the other hand, have reduced H but not A.

Figure 6.2: Change in Multidimensional Poverty and Change in Income Poverty



From the rural-urban analysis, we found that the disparity in poverty between these two regions has declined over time. However, the same is not quite true when we analyse India's performance across states. Overall, the less-poor states in 1999 reduced poverty more than their poorer counterparts. Given that the poorest states reduced poverty at a rate that was below the

national average, the disparity in poverty across states cannot have declined in 2006. This is evident from 'Panel A' of Figure 6.1, where we plot the multidimensional headcount ratio in 1999 on the vertical axis and the per annum reduction in the headcount ratio till 2006 on the horizontal axis. The linear trend line shows that the larger the multidimensional headcount ratio in 1999, the slower the reduction, but there is considerable variation. Orissa has the same high rate of poverty reduction as Himachal Pradesh, despite the fact that 74.5% of people in Orissa were poor in 1999 as opposed to 39.2% in Himachal Pradesh.

Is this also true for the income headcount ratio? In 'Panel B' of Figure 6.1, we present the income poverty headcount ratio in 1993–94 on the horizontal axis and the change in poverty per annum till 2004–05 on the vertical axis. The state-wide income poverty figures have been obtained from GoI (2009). It is clear that the linear trend line slopes downward, implying that the poorer the state had been in 1993–94, the faster the reduction was. Thus, what we have found in case of multidimensional poverty does not hold for the income poverty measure.[30]

Like the multidimensional headcount ratio, we find a similar trend when we plot the adjusted headcount ratio on the horizontal axis and its change on the vertical axis. The reason may be that deprivations in other non-monetary and social indicators have not changed in the same way as income has changed across states. In order to understand which indicator may have caused this trend in M_0 and H, we use the property of M_0 which allows it to be expressed as a weighted average of the censored headcount ratios of the ten indicators. In Table A3 in the appendix, we present graphs to explore which indicators may be responsible for this trend. We find that most of the indicators, except 'attendance' and 'water', have similar trends as overall poverty. The states with higher censored headcount ratios in 1999 have not made relatively larger reductions by 2006. This is quite a disturbing finding and categorically shows a need for improvement.

Not all states have reduced multidimensional poverty in the same manner. For example, Madhya Pradesh and Uttar Pradesh both had similar level of M_0 in 1999: 0.368 for Madhya Pradesh and 0.348 for Uttar Pradesh. They reduced poverty statistically significantly by similar magnitude over the seven year period, but by improving in different indicators. Schooling, attendance and mortality had much larger reductions in censored headcount ratios in Madhaya Pradesh than in Uttar Pradesh; whereas sanitation, water and assets had much larger reductions in censored headcount ratios in Uttar Pradesh than in Madhya Pradesh. These improvements can be verified by looking at the reduction in the contribution of these indicators to the overall poverty presented in Table A4 in the appexdix.[31]

6.2. Performance across Social Groups

Besides understanding the change in poverty across geographical regions, it is important to understand how poverty has changed across different social groups. The two subgroups that

[30] We also analysed the trend in another way, restricting our scope to the 16 large states of India. For the income headcount ratios, the downward slope vanishes. In fact, the trend line shows no slope. The MPI headcount ratios, however, still show a trend with a strictly positive slope. It would be desirable to analyse a longer time period for MPI comparisons, but this is not possible.

[31] We present the improvement in the percentage of population deprived, censored headcount ratios and the change in the contribution of each indicator across all geographic regions in Table A4 in the Appendix.

certainly are of interest in the Indian context are castes and religions. The results are reported in Table 6.2 with the same structure as in Table 6.1.[32]

The first four rows in Table 6.2 report the results across castes and tribes. We classify the population into the four categories that were feasible in the NFHS datasets: Scheduled Castes (SC), Scheduled Tribes (ST), Other Backward Classes (OBC), and General. The general category includes all but those residing in households self-identified as SCs, STs, or OBCs. It is clear from the table that there have been statistically significant reductions in both M_0 and H for each of the four subgroups. However, the reduction has not been uniform across all subgroups. The fastest reduction in the proportion of poor has taken place among the general category (12.2%); whereas the slowest reduction has taken place in the ST category. This trend results in enhancing disparity because the prevalence of multidimensional poverty was highest within the ST category and lowest within the general category in 1999, hence the gap between these two groups widened in 2006.

Table 6.2: Performance across Social Subgroups

	1999				2006				Change			
Castes	**Pop. Share**	M_0	H	A	**Pop. Share**	M_0	H	A	M_0		H	
SC	18.3%	0.378	68.8%	55.0%	19.1%	0.307	58.3%	52.6%	-0.071	*	-10.5%	*
ST	8.9%	0.458	80.3%	57.0%	8.5%	0.417	74.0%	56.3%	-0.041	*	-6.3%	*
OBCs	32.6%	0.301	57.9%	52.1%	40.2%	0.258	50.8%	50.8%	-0.043	*	-7.1%	*
General	40.1%	0.229	45.2%	50.6%	32.2%	0.164	33.0%	49.7%	-0.065	*	-12.2%	*
Religion												
Hindu	80.8%	0.306	57.9%	52.8%	80.4%	0.249	48.6%	51.2%	-0.057	*	-9.3%	*
Muslim	13.2%	0.320	59.0%	54.3%	14.1%	0.301	54.8%	55.0%	-0.019		-4.3%	
Christian	2.6%	0.196	40.5%	48.3%	2.3%	0.158	32.3%	49.0%	-0.038		-8.3%	*
Sikh	1.8%	0.115	25.9%	44.6%	1.7%	0.078	17.5%	44.5%	-0.038	*	-8.4%	*
Other Religions	1.5%	0.222	42.7%	51.9%	1.6%	0.221	42.8%	51.8%	0.000		0.0%	

The large reduction in the multidimensional headcount ratio among the general category should, however, be interpreted with more care. Note that there has been a shift of population from the general category to the OBCs between 1999 and 2005 (see GoI 2006, pp. 6–7). It may be possible that a less well-off group of people from the general category have been moved to the OBC category causing a larger apparent reduction in the proportion of poor within the general category. Reduction in M_0 has also been slowest among STs, but highest among SCs instead of the general category – which is a positive finding. It appears that SCs have had a much faster reduction in the average deprivation shares among the poor; whereas, although a larger number of poor have been lifted out of poverty within the general category, the average deprivation shares among those who have remained poor have not changed.

Let us now analyse how different religious groups in India have performed over time using the next five rows in Table 6.2. We have classified the population into five major groups: Hindu, Muslim, Christian, Sikh and Others.[33] It is evident that more than 80% of the population reside in Hindu households and nearly 14% in Muslim households. The population composition in

[32] Note that in Table 6.2 and Table 6.3 the population weighted average of subgroup M_0's and H's should be equal to the national M_0 and H. However, as some households did not report their social status, the population-weighted averages may not be equal to the national estimates. Another possible source of mismatch may be that we have rounded the statistics to closest possible decimals.

[33] We would have liked to analyse poverty within other religious groups in greater detail, but the sample size does not permit this. Hence, we combined all other religions into one population subgroup.

terms of religion has not changed drastically between 1999 and 2006. Both H and M_0 had a statistically significant decline among Hindus and Sikhs. Among Christians, H has fallen significantly, but the reduction in M_0 has not been significant. Among Muslims, both have fallen but have not had a statistically significant decline. Finally, poverty does not appear to have changed between 1999 and 2006 in the small category of 'other' religions. Among all, the prevalence of poverty was highest among Muslims in 1999 and their H and M_0 have improved least – indeed there was no statistically significant change across the seven years. Although statistically insignificant, the average deprivation shares among Muslims even increased.[34]

A common feature in the subgroup analysis across states and across social groups is that poverty in the subgroups with the lowest poverty has fallen faster than for subgroups with the highest poverty, although in between are some positive outliers such as Orissa and SCs. At the state level, we have found that poorer states such as Bihar, Uttar Pradesh, Madhya Pradesh, Rajasthan and West Bengal have had a slower reduction in poverty than the less-poor states such as in South India. Among castes, the reduction in poverty among Scheduled Tribes, which have been poorest, has been slowest. Similarly, poverty for Muslims, the religious group with the highest poverty in 1999, has fallen the least. Hence, although there has been a statistically significant reduction in poverty nationally, it has not been uniform across different subgroups and in fact disparity across these subgroups in terms of poverty increased between 1999 and 2006.

6.3. Performance across Household Characteristics

We now explore if poverty varies across household characteristics. We classify the population in three different ways: by household head's gender, household head's education, and by household size. The results across household characteristics are reported in Table 6.3.

Table 6.3: Performance by Household Characteristics

	1999				2006				Change			
Head's Gender	**Pop. Share**	M_0	H	A	**Pop. Share**	M_0	H	A	M_0		H	
Female	7.6%	0.275	52.9%	52.0%	10.8%	0.278	52.3%	53.1%	0.003		-0.5%	
Male	92.4%	0.302	57.1%	52.9%	89.2%	0.247	48.0%	51.5%	-0.055	*	-9.1%	*
Head's Education												
No Education	37.4%	0.448	78.4%	57.1%	37.8%	0.398	71.6%	55.6%	-0.050	*	-6.8%	*
1–5 Years	22.7%	0.310	60.9%	50.9%	18.9%	0.249	50.8%	49.1%	-0.060	*	-10.1%	*
6–10 Years	27.9%	0.188	40.9%	46.1%	29.5%	0.151	33.2%	45.4%	-0.037	*	-7.7%	*
11–12 Years	5.3%	0.114	25.5%	44.7%	6.0%	0.092	21.0%	43.8%	-0.022	*	-4.5%	*
12 Years or More	6.6%	0.055	12.9%	42.8%	7.9%	0.041	9.9%	41.3%	-0.015	*	-3.1%	*
Household Size												
1–3	10.2%	0.248	50.9%	48.7%	14.6%	0.194	41.1%	47.1%	-0.054	*	-9.8%	*
4–5	31.6%	0.265	50.7%	52.3%	36.0%	0.213	42.0%	50.6%	-0.053	*	-8.8%	*
6–7	28.4%	0.321	59.0%	54.5%	26.6%	0.285	53.2%	53.6%	-0.036	*	-5.8%	*
8–9	14.2%	0.340	62.2%	54.6%	12.3%	0.318	58.8%	54.2%	-0.021	*	-3.4%	*
10 or More	15.5%	0.332	64.2%	51.7%	10.4%	0.292	57.0%	51.3%	-0.040	*	-7.2%	*

The first two rows of the table report poverty figures when the entire population has been divided by the gender of the head of the household. In 1999, only 7.6% people lived in female-headed households. This increased in 2006 to10.8% of people living in female-headed

[34] We present the improvement in the percentage of population deprived, censored headcount ratios and the change in the contribution of each indicator across social groups in Table A5 in the Appendix.

households. The reduction in national poverty has been solely driven by a reduction in poverty among the male-headed households, whose M_0 decreased at a statistically significant level from 0.302 by 0.055 point. Similarly, H has decreased 9.1 percentage points, from 57.1% in 1999 to 48% in 2006. However, poverty was unchanged among female-headed households. Instead, their average deprivation share increased by 1.1 percentage points. Hence, it appears that the reduction in the overall poverty has not helped the female-headed households. To understand this particular matter better, further research is required.

The next five rows of Table 6.3 report the results when the population is divided by the education level of the household head. Poverty among all groups has fallen significantly. As expected, the prevalence of poverty is negatively related to the level of education of the household head. The composition of population has changed over time. The positive aspect is that the population share of households where the head has finished more than 6 years of education has increased and those in households where the head has finished only 1–5 years of education decreased. Also, poverty has decreased fastest for the group whose heads have 1–5 years of education. However, the population share among households where the head has not completed any education has not changed. Furthermore, the rate of poverty reduction for this, the poorest group, which comprises 37% of the population, is lower than for households whose heads have 1–10 years of schooling. So yet again, we see that the poorest group has reduced its poverty at a slower rate than others; thus, the disparity between the poorest group and the rest may have increased. For example, in 1999, the poorest group was 1.4 times poorer than the next-poorest group; in 2006, it was 1.6 times poorer.

The final five columns analyse poverty when the population is divided by the size of the households. In 2006, more people live in smaller households. The proportion of people living in households with 1–3 members has increased from 10.2% to 14.6%, and the proportion of people living in 4–5 member households has increased from 31.6 to 36%. Thus, the proportion of people living in households with five or fewer members has increased from 41.6% to over 50%. Poverty, in both periods, is higher in larger households. Although poverty has fallen significantly across all subgroups in this categorization, the reduction has been much faster among households with 5 members or fewer. Indeed, as before, the least-poor households reduced poverty the fastest (those with 1–3 members), whereas the poorest group (having 8–9 members) had the slowest rate of reduction. Thus, disparity in poverty across groups has also increased in this case once again.

The studies in this section document how, across many different definitions of population subgroups (region, caste, religion, household head's gender and education, or household size) poverty among the poorest subgroups has been reduced at the slowest rate, thus poverty reduction has gone together with increasing disparity among these subgroups.

7. Poverty among the Poorest of the Poor

As of now, we have analysed how poverty has changed nationally and across subgroups using mainly three statistics: the main poverty measure – the adjusted headcount ratio (M_0) – and its two partial indices, the multidimensional headcount ratio (H) and the average deprivation scores among the poor (A). Inter-temporal analysis based on these statistics reveals the movement for a

group on average. Now we wish to supplement this with a closer scrutiny of the situation of the poorest of the poor.[35]

7.1. Discerning the Poorest of the Poor

Let us provide an example as to why it is necessary to scrutinize the poorest of the poor. Suppose, a deprivation score vector in year 1999 was $c = (0, 0.2, 0.4, 0.6, 0.8, 1)$; and so for $k = 1/3$, M_0 =0.467, H =66.7%, and A =70.0%. Now, suppose in two different time lines, the deprivation score vector becomes $c' = (0, 0.2, 0.2, 0.4, 0.8, 1)$ and $c'' = (0, 0.2, 0.2, 0.5, 0.8, 0.9)$ in year 2006. In both c' and c'', the least poor person has become non-poor, but in c' the deprivation score of the second least poor person has improved, whereas in c'' the situation of the second least poor and the poorest of the poor have both improved. None of the three statistics is able to capture this distinction. Note that M_0 and H for both c' and c'' improve to 0.367 and 50%, respectively; whereas A deteriorates for both to 73.3%.

The above example uses a household's deprivation scores, which is a measure of multiple deprivations or the *intensity* of deprivations of the poor, to distinguish the poorest. However, this does not capture the difference in the depth of deprivation in one or more indicators. For example, two people may each be deprived in half of the indicators, but one is just barely below the deprivation cutoff whereas another is further below the cutoff in each indicator. Thus, we can think of two distinct ways to distinguish the poorest of the poor: one is by their intensity as in the example in the previous paragraph and the other is by the depth of their deprivation.

To discern the poor who have a larger intensity of deprivations (whom we will call *intensely poor*), we use a higher poverty cutoff – in this case of k =1/2, which identifies those who have deprivation scores of 0.5 and above. Discerning the *deeply poor*, on the other hand, requires choosing a more stringent deprivation cutoff for each indicator.[36] We refer to these deprivation cutoffs as *ultra*-deprivation cutoffs. We refer to the poor identified by the ultra-deprivation cutoffs (and $k = 1/3$) as deeply poor. Segmenting the poor into these two categories allows us to study the inter-temporal changes among the poorest of the poor more closely. We can also study the trajectories of the moderately poor (those who are neither deeply nor intensely poor). We provide a diagrammatic outline of this framework in Figure 7.1.

Area OBCD in Figure 7.1 denotes the entire population at a given point in time. We normalize the area to one so that all sub-areas are expressed in fractions or percentages. On the horizontal axes of the diagram, we measure the poverty cutoff, whose value decreases from one to zero as we move towards the right along the axis. On the vertical axis, we show the deprivation cutoff vector. The solid horizontal line at MPI-I distinguishes those who are not deprived in any indictor from those who are deprived in at least one of the ten MPI-I indicators using the deprivation cutoffs outlined in Table 4.1. Area I above the MPI-I line contains the population that are not deprived in any of the ten indicators; whereas the area below the MPI-I line (area OBCD minus area I) contains the population that are deprived in at least one of the ten indicators. A person is identified as MPI-I poor if the person resides in a household that is deprived in 1/3 of weighted indicators. Thus, the MPI-I poor are contained in the area below the

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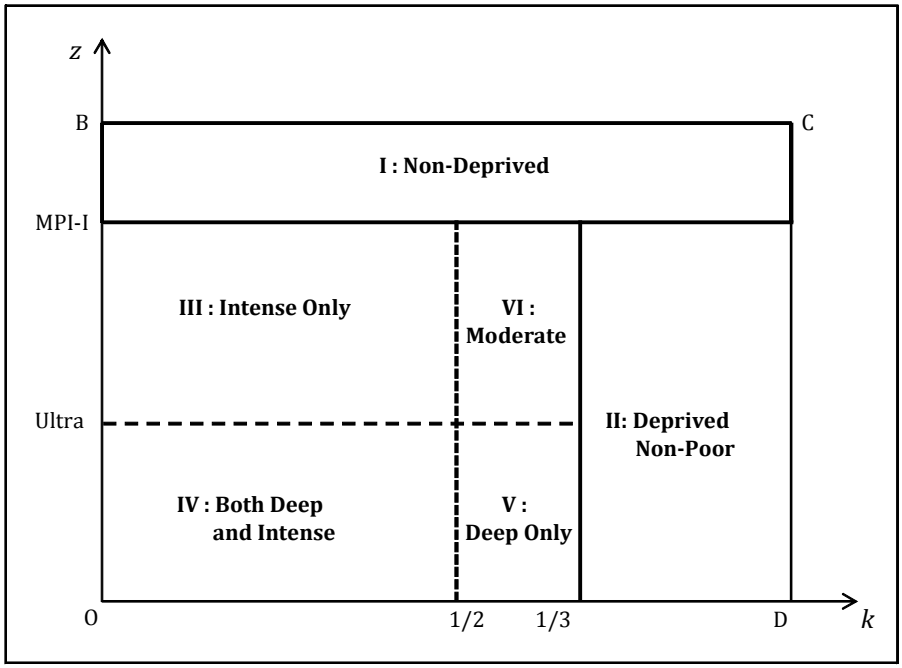
35 Poverty among the poorest has been referred variously as extreme (Wodon 2001) or ultra poverty, where poorest are identified either by deeper calorie deficit (Lipton 1983), lower wage (Cornia 1994) or lesser income (Ahmed *et al.* 2007).

36 When cardinal data are available, other measures – adjusted poverty gap and adjusted squared poverty gap – proposed by Alkire and Foster (2011) may be used. These measures are multidimensional extensions of the FGT class of measures proposed by Foster, Greer and Thorbecke (1984).

MPI-I line and to the left of the line corresponding to $k = 1/3$ or the area III + IV + V + VI. Given that we normalize the entire area to one, $H =$ III + IV + V + VI. Area II contains the *deprived non-poor*: the population who are deprived in at least one indicator but who have a deprivation score less than 1/3.

The intensely poor are identified by a more stringent poverty cutoff of $k = 1/2$ which is shown by the dotted vertical line in Figure 7.1. Areas III + IV, to the left of the dotted vertical line and below the MPI-I line, contain the population who are deprived in half or more of weighted indicators. Note that the intensely poor are identified as deprived in any indicator by the MPI-I deprivation cutoffs and so lie below the MPI-I line. Now, the dashed horizontal line referred to as 'ultra' discerns those among the MPI-I poor who are not deprived by any of the ultra-deprivation cutoffs from those who are deprived in one-third of weighted indicators using the ultra-deprivation cutoffs. Areas IV + V contain those who are identified as deeply poor.

Figure 7.1: Two Approaches to Identify the Poorest of the Poor



It is now obvious that the overall MPI-I headcount ratio is a sum of four components: III, IV, V, and VI. Area III contains those who are intensely poor, but are not identified as deeply poor. They are deprived in a larger number of indicators but are not necessarily deeply deprived in these indicators. Area V, on the contrary, identifies those who are deeply deprived by the ultra-deprivation cutoffs but are not deprived in a large number of indicators or are not intensely poor. Area IV contains those who are both intensely poor and deeply poor. These poor people are deprived in a large number of indicators, as well as deeply deprived in these indicators, and thus they, truly, are the *poorest of the poor*. Finally, Area VI contains those who are neither intensely poor nor deeply poor. We refer to these MPI-I poor as *moderately* poor – those who are deprived in a relatively small proportion of indicators and are not deeply deprived in these indicators at the same time.

This type of decomposition of the multidimensional headcount ratio, in fact, may be useful for inter-temporal policy analysis of poverty. The overall change in the multidimensional headcount ratio can also be decomposed into four elements as: $\Delta H = \Delta III + \Delta IV + \Delta V + \Delta VI$.

7.2. The Ultra-Deprivation Cutoffs

The ultra-deprivation cutoffs for the ten indicators are outlined in Table 7.1.[37] The nutrition indicator now identifies a household as deprived if there is any woman with a BMI lower than 17 Kg/m^2 or a child with a z-score lower than -3 standard deviations away from the mean. The mortality indicator identifies a household as deprived if any woman in the household has lost two or more children under the age of five years. Note that deprivation in this indicator requires two or more deaths of children of any one woman in the household and not just two or more deaths in the entire household.[38] The schooling indicator identifies a household as deprived if no adult member in the household has completed even a single year of education; whereas, the attendance indicator identifies a household as deprived if no child in the household in the age group of 6–14 is attending school in a particular academic year.

Table 7.1: The Ultra-Deprivation Cutoffs of the Ten Indicators

Dimension	Indicator	Deprivation Cutoff
Education	Schooling	No household member has completed even one year of schooling
	Attendance	No school-aged child (6–14) in the household is attending school in the academic year of study
Health	Nutrition	Any ever-married woman with a BMI lower than 17 Kg/m^2 or any child under age 36 months having a z-score lower than -3SD from the mean z-score
	Mortality	Two or more children under the age of five of an ever-married woman have died in the household
Standard of Living	Electricity	The household has no electricity
	Sanitation	Members in the household have no toilet and use bush or field for sanitation
	Water	The drinking water source is unprotected and more than a 45-minute walk (round trip)
	Housing	The household resides in a kaccha house
	Cooking fuel	The household mainly cooks with wood or straw/shrubs/grass
	Assets	The household does not own any of: radio, TV, telephone, bike, motorbike or refrigerator, and does not own a car or truck

We set more stringent deprivation cutoffs for five of the six standard-of-living indicators. We were not able to set a more stringent deprivation cutoff for the electricity indicator because the only information available in the dataset was whether each household had access to electricity or not. More information, such as the duration of access to electricity, would have allowed us to set a more stringent deprivation cutoff. The sanitation dimension identifies a household as deprived if the household does not have access to any facility and members of the household use open bush or field as a sanitation facility. For the water indicator, a household is identified as deprived if the water source is unprotected and the source is more than 45 minutes' walking distance

[37] Note that because data are ordinal or categorical, while we can say that the ultra deprivation cutoffs identify a subset of the MPI-I, we cannot make any claims as to whether each indicator's cutoff reflects a comparably severe deprivation, in comparison with the first deprivation cutoffs, as another indicator. As other 'ultra' deprivation cutoffs are possible to implement, their selection and justification is a topic for further research.

[38] An alternative indicator may be two or more deaths of children from any household, which, however, may be highly biased by the household size. We consider the death of two children for a mother from a smaller household more tragic than the death of any two children from a significantly larger household having several women of reproductive age, and thus a deeper form of deprivation in the mortality indicator.

(round trip) away from the residence. The housing dimension identifies a household as deprived if the household lives in a kaccha house built with unimproved materials for floor, roof and wall throughout. The cooking fuel indicator identifies a household as deprived if the household uses mainly wood and straw/shrubs/grass as cooking fuel.[39] For the final indicator on assets, we identify a household as deprived if the household does not even own even one of the basic assets: radio, television, telephone, bike, motorbike or refrigerator.

Table 7.2: Change in Deprivation for Ultra-Deprivation Cutoffs between 1999 and 2006

Indicator	1999		2006		Change	
	% Deprived	Confidence Interval (95%)	% Deprived	Confidence Interval (95%)		
Schooling	10.5%	(10.1%, 10.9%)	9.5%	(9.1%, 10.0%)	-1.0%	*
Attendance	8.2%	(7.9%, 8.5%)	7.4%	(7.0%, 7.8%)	-0.8%	*
Mortality	8.6%	(8.4%, 8.9%)	6.8%	(6.5%, 7.1%)	-1.9%	*
Nutrition	20.4%	(19.9%, 20.9%)	17.9%	(17.4%, 18.3%)	-2.5%	*
Electricity	39.2%	(38.4%, 40.0%)	32.8%	(31.8%, 33.8%)	-6.3%	*
Sanitation	70.3%	(69.4%, 71.1%)	56.7%	(55.6%, 57.7%)	-13.6%	*
Water	6.7%	(6.3%, 7.2%)	6.2%	(5.6%, 6.7%)	-0.6%	
Housing	31.9%	(31.0%, 32.7%)	13.4%	(12.6%, 14.2%)	-18.4%	*
Cooking Fuel	60.6%	(59.8%, 61.5%)	54.9%	(53.8%, 56.0%)	-5.7%	*
Assets	28.7%	(28.1%, 29.3%)	20.7%	(20.0%, 21.3%)	-8.0%	*

In

Table 7.2, we report the percentage of people deprived in the ten indicators based on the ultra-deprivation cutoffs. Comparing with the percentages of people deprived by the MPI-I deprivation cutoffs reported in Table 5.1, we find, predictably, that the extent of deprivations in the ultra-deprivation cutoffs is much lower. Ultra-deprivations in the education and health indicators are less than half of the MPI-I deprivations in 1999 and nearly that in 2006. Ultra-deprivations are also much lower for 'water', 'housing' and 'assets'. Unlike in the case of MPI-I, the reduction in deprivation in 'attendance' is statistically significant for the ultra-deprivation cutoff, but the reduction in deprivation in 'water' is no longer significant.

7.3. Decomposition of Multidimensional Headcount Ratio

We now present the decomposition of multidimensional poverty in the Indian context. In Table 8.1, we present the results at the national level, across geographic regions, and across social groups. The left column lists the regions. The next five columns report the multidimensional headcount ratios for 1999 and their decomposition into four components as explained in Figure 7.1. The results are sobering: nearly 66.4% of India's multidimensionally poor people in 1999 were deeply and/or intensely poor; only 33.6% were moderately poor. In particular, nationally, 56.8% of the population were MPI-I poor: 19.3% were both deeply poor and intensely poor, 11.3% were intensely poor but not deeply poor, 7.1% were deeply poor but not intensely poor, and only 19.1% were moderately poor. This dramatic and worrying finding illuminates the need for further analyses regarding the depth and intensity of poverty, how this profile of poverty changes over time (see below), and, eventually, how it compares with other countries.

[39] Instead of the ultra-poverty indicator for cooking fuel in this paper, we could have potentially used other indicators such as whether the household using solid fuel has a chimney or separate kitchen. However, we do not have comparable information across two datasets.

The next five columns report the multidimensional headcount ratios for 2006 and their four components. The final five columns report changes over time in the multidimensional headcount ratio and four components. We already know that the multidimensional headcount ratio has fallen by 8.3% nationally. If we break down the overall change in H into four elements as discussed at the end of Section 7.1, the we find that 5.4% of the reduction has been attributed to those who are both intensely and deeply poor, only 0.8% has been attributed to those who are intensely poor but not deeply poor, and 1.6% has been attributed to those who are deeply poor but are not intensely poor. The reduction in moderately poor has been merely 0.5%.

What does this mean? First of all, it means that, as expected, reduction in moderately poor (which is better than being deeply or intensely poor) has been relatively slower. Second, we see that the poorest of the poor – the deeply and intensely poor group – decreased by nearly 28%: from 19.3% to 13.9% of the population, which is also very good. We note that the deeply poor decreased relatively more than the intensely poor group, both in absolute and relative terms. Thus the best news is that across the four subgroups of the poor, poverty reduction among the poorest of the poor has been the strongest between the two periods, followed by the deeply poor then intensely poor. Thus at a national level, there is a very positive evolution.

However, this decomposition pattern has not been uniform across all subgroups, as reported in Table 8.1. In urban areas, the reduction in H has been attributed to a reduction in all four components; whereas, in rural areas, the share of moderately poor has increased. We see some less-positive trends in some states: for example, both Rajasthan and Uttar Pradesh have reduced H by nearly 5% and had about 23% of people in the deeply and intensely poor category in 1999, but Uttar Pradesh reduced this group by 7.1% whereas Rajasthan only reduced it by merely 3.7%. Madhya Pradesh, which also reduced its multidimensional headcount ratio by nearly 5 percent, reduced its 23.7% of deeply and intensely poor by a mere 3.4%. The different between Madhya Pradesh and Rajasthan is that Madhya Pradesh reduced the share intensely poor more than that of Rajasthan. Thus, it is interesting enough to see that all three states – Madhya Pradesh, Rajasthan and Uttar Pradesh – had more that 63% of their population MPI-I poor in 1999 and all of them have reduced the multidimensional headcount ratio by around 5%, but following different trajectories. We also see worrying patterns among the Scheduled Tribes again. Although the reduction in the share of intensely poor and deeply poor has been second largest among STs, yet the reductions in other groups have been larger. Similarly among the Muslim population, the deeply and intensely poor category fell only about 1.5% (from 20% to 18.4%), leaving them with a starkly higher percentage than the other religious categories in 2006. A common pattern that can be seen across almost all subgroups is that the share of population that is both intensely poor and deeply poor has gone down even when the share of moderately poor has gone up. However we have noted that the pace of changes across groups has varied greatly, and that intra-group disparities have been exacerbated. Further research is required on these types of decompositions.

8. Concluding Remarks

This paper created an MPI-I which, although slightly less accurate than the international MPI, has the great advantage of being strictly comparable across time. Based on these comparable indicators, our findings show that, nationally, multidimensional poverty has fallen in India between 1999 and 2006. In order to understand how this reduction has taken place, we have broken down the index into different components. Breaking down the index into the multidimensional headcount ratio and average intensity of deprivation among the poor, we find that the reduction in multidimensional poverty has been mainly caused by a significant reduction

in the multidimensional headcount ratio. Although statistically significant, the reduction in the average intensity of poverty has been smaller. Among states, Andhra Pradesh has reduced the intensity of deprivations among the poor most; whereas, Kerala has reduced the multidimensional headcount ratio most. We then break down the overall poverty index across indicators and find that the reduction has been fastest in access to electricity, drinking water, improved sanitation, and housing. This has led to an increase in the relative contributions of deprivations such as nutrition and school attendance to India's poverty in the latest period.

Table 8.1: Intensely Poor, Deeply Poor and Moderately Poor in India and across Population Subgroups

	1999					2006					Change (Δ)				
	H	**III**	**IV**	**V**	**VI**	***H***	**III**	**IV**	**V**	**VI**	***H***	**III**	**IV**	**V**	**VI**
India	56.8%	11.3%	19.3%	7.1%	19.1%	48.5%	10.5%	13.9%	5.5%	18.6%	-8.3%	-0.8%	-5.4%	-1.6%	-0.5%
Rural	68.6%	13.7%	24.5%	8.8%	21.5%	60.8%	13.3%	18.3%	7.0%	22.2%	-7.8%	-0.4%	-6.2%	-1.8%	0.6%
Urban	24.4%	4.8%	4.8%	2.5%	12.3%	20.5%	4.2%	3.8%	2.0%	10.6%	-4.0%	-0.6%	-1.1%	-0.5%	-1.8%
States															
Andhra Pradesh	56.7%	11.3%	20.4%	7.6%	17.3%	41.6%	7.2%	9.2%	7.1%	18.1%	-15.1%	-4.2%	-11.2%	-0.5%	0.8%
Arunachal Pradesh	47.2%	8.7%	9.7%	7.8%	20.9%	51.5%	9.7%	14.4%	7.7%	19.7%	4.3%	1.0%	4.6%	-0.1%	-1.3%
Assam	65.7%	15.4%	20.8%	5.8%	23.6%	54.9%	17.3%	11.8%	3.7%	22.2%	-10.8%	1.8%	-9.0%	-2.1%	-1.4%
Bihar	76.1%	13.0%	36.1%	9.4%	17.7%	72.0%	15.3%	30.1%	7.0%	19.6%	-4.1%	2.3%	-6.0%	-2.4%	1.9%
Goa	24.4%	4.5%	3.4%	2.2%	14.2%	13.2%	1.6%	1.4%	2.1%	8.2%	-11.1%	-2.9%	-2.1%	-0.2%	-6.0%
Gujarat	47.9%	9.1%	17.0%	6.2%	15.6%	36.0%	7.8%	8.7%	4.5%	14.9%	-11.9%	-1.3%	-8.3%	-1.7%	-0.7%
Haryana	40.3%	8.5%	7.7%	3.7%	20.5%	33.1%	6.5%	6.2%	3.1%	17.4%	-7.2%	-2.0%	-1.5%	-0.6%	-3.1%
Himachal Pradesh	36.3%	4.1%	3.5%	8.5%	20.2%	24.3%	3.0%	1.5%	3.3%	16.5%	-12.0%	-1.1%	-2.0%	-5.2%	-3.7%
Jammu	46.0%	11.9%	8.8%	3.7%	21.7%	31.7%	6.8%	4.7%	2.9%	17.4%	-14.3%	-5.1%	-4.1%	-0.8%	-4.3%
Karnataka	50.8%	10.1%	14.2%	6.5%	19.9%	37.5%	5.7%	8.2%	5.2%	18.4%	-13.3%	-4.5%	-6.0%	-1.3%	-1.5%
Kerala	32.6%	6.1%	2.2%	1.7%	22.5%	9.5%	1.2%	0.4%	0.9%	7.1%	-23.0%	-4.9%	-1.8%	-0.8%	-15.5%
Madhya Pradesh	67.6%	16.2%	23.7%	5.7%	22.0%	62.4%	13.7%	20.3%	6.8%	21.7%	-5.2%	-2.5%	-3.4%	1.1%	-0.3%
Maharashtra	46.0%	8.6%	12.1%	7.9%	17.4%	32.9%	6.0%	6.2%	4.0%	16.8%	-13.1%	-2.7%	-5.9%	-3.9%	-0.6%
Manipur	44.6%	7.5%	9.6%	6.7%	20.8%	32.4%	6.7%	4.2%	2.2%	19.3%	-12.2%	-0.9%	-5.4%	-4.5%	-1.5%
Meghalaya	67.4%	13.2%	25.6%	6.6%	22.0%	55.2%	10.3%	22.7%	4.9%	17.3%	-12.2%	-2.9%	-2.9%	-1.7%	-4.7%
Mizoram	32.6%	6.7%	5.8%	1.8%	18.3%	21.1%	3.9%	3.1%	1.2%	12.9%	-11.5%	-2.8%	-2.7%	-0.6%	-5.4%
Nagaland	50.4%	8.3%	12.8%	8.4%	21.0%	44.4%	9.6%	10.2%	4.7%	19.9%	-6.0%	1.3%	-2.6%	-3.7%	-1.1%
Orissa	70.8%	12.9%	26.6%	9.4%	21.9%	58.7%	10.2%	20.1%	8.5%	20.0%	-12.1%	-2.8%	-6.5%	-0.9%	-1.9%
Punjab	25.7%	5.6%	3.9%	1.9%	14.4%	19.2%	4.8%	2.8%	1.2%	10.5%	-6.5%	-0.8%	-1.1%	-0.7%	-4.0%
Rajasthan	63.5%	12.5%	23.8%	7.3%	20.0%	58.5%	11.7%	20.0%	7.2%	19.5%	-5.0%	-0.7%	-3.7%	0.0%	-0.5%
Sikkim	36.1%	8.1%	6.7%	3.0%	18.4%	28.9%	6.3%	3.6%	2.3%	16.7%	-7.2%	-1.8%	-3.0%	-0.6%	-1.7%
Tamil Nadu	42.8%	6.9%	7.7%	8.3%	19.8%	26.4%	3.1%	3.0%	5.9%	14.4%	-16.4%	-3.8%	-4.8%	-2.4%	-5.4%
Tripura	55.5%	11.0%	15.5%	6.5%	22.5%	46.6%	11.5%	9.2%	2.6%	23.3%	-8.9%	0.4%	-6.2%	-3.8%	0.8%
Uttar Pradesh	64.9%	12.8%	23.4%	9.3%	19.4%	59.5%	15.5%	16.3%	5.8%	21.8%	-5.4%	2.7%	-7.1%	-3.4%	2.5%
West Bengal	60.8%	14.1%	20.9%	6.0%	19.8%	53.8%	13.3%	14.5%	4.9%	21.2%	-7.1%	-0.9%	-6.4%	-1.1%	1.3%
Social Groups															
SC	68.8%	13.4%	27.0%	8.8%	19.6%	58.3%	12.7%	17.8%	7.1%	20.5%	-10.5%	-0.7%	-9.1%	-1.7%	1.0%
ST	80.3%	15.9%	36.2%	9.4%	18.8%	74.0%	15.7%	30.4%	8.7%	19.3%	-6.3%	-0.2%	-5.8%	-0.7%	0.5%
OBC	57.9%	11.3%	18.8%	7.5%	20.2%	50.8%	11.1%	13.6%	5.8%	20.3%	-7.1%	-0.2%	-5.3%	-1.7%	0.1%
General	45.2%	9.3%	12.3%	5.6%	18.0%	33.0%	7.0%	7.5%	3.3%	15.2%	-12.2%	-2.3%	-4.8%	-2.3%	-2.8%
Hindu	57.9%	11.3%	19.9%	7.5%	19.2%	48.6%	10.3%	13.5%	5.8%	19.0%	-9.3%	-1.0%	-6.4%	-1.7%	-0.2%
Muslim	59.0%	13.4%	20.0%	5.7%	19.9%	54.8%	13.5%	18.4%	4.3%	18.5%	-4.3%	0.1%	-1.5%	-1.4%	-1.4%
Christian	40.5%	6.9%	10.4%	6.2%	17.0%	32.3%	6.9%	8.1%	4.4%	12.9%	-8.3%	0.0%	-2.3%	-1.8%	-4.1%
Sikh	25.9%	4.9%	3.5%	2.3%	15.2%	17.5%	3.7%	1.9%	1.4%	10.5%	-8.4%	-1.2%	-1.6%	-0.9%	-4.7%
Other	42.7%	8.3%	14.0%	5.7%	14.7%	42.8%	7.5%	12.9%	5.1%	17.3%	0.0%	-0.8%	-1.1%	-0.6%	2.6%

III – Intensely Poor Only; IV – Both Deeply and Intensely Poor; V – Deeply Poor Only; and VI – Moderately Poor

Decomposing national poverty reduction across various population subgroups, we find that the reduction has generally been larger for the subgroups that already performed better in 1999. For example, among states, the initially better-performing states, such as the South Indian states, Himachal Pradesh, Gujarat, and Maharashtra, reduced multidimensional poverty more than the initially poorer states, such as Uttar Pradesh, Madhya Pradesh, Rajasthan, and Bihar. This pattern is in contrast to the pattern of change in income poverty across states between 1993–94 and 2004–05, in which the poorest states reduced income poverty the most. Among castes and tribes, there have been statistically significant reductions in multidimensional poverty across all groups, but the reduction was slowest for the poorest group, Scheduled Tribes. Similarly across religious groups, Muslims, the poorest subgroup in 1999, saw the least reduction in poverty over the seven-year period.

Decomposing the population based on household characteristics generates additional insights. Decomposing the population across different household sizes, we find that multidimensional poverty tended to be higher among the larger households in 1999 and that the reduction in poverty has been slowest for these larger and poorer households. Also, the share of population living in female-headed households increased from 7.6% in 1999 to 10.8% over the next seven years. In 1999, multidimensional poverty among the female-headed households was lower than the male-headed households. In contrast, multidimensional poverty was higher among the female-headed households in 2006, bucking the national downward trend. There was a statistically significant decrease in poverty among the male-headed households, but there was no change in the situation among female-headed households. This is an area for future research.

Finally, in order to understand the situation among the poorest of the poor, we identify subgroups among the poor using two additional criteria. One identifies a household as intensely poor if the household is deprived in a larger share of indicators (more than half, rather than one-third). The second identifies a household as deeply poor if the household is deeply deprived in each of the MPI-I indicators. The set of the poorest of the poor identified by the first of these two methods is called intensely poor and those identified by the second method are called deeply poor. We divide the MPI-poor people into four groups: those who are both intensely poor and deeply poor, those who are deeply poor but are not intensely poor, those who are intensely poor but are not deeply poor, and those who are moderately poor. Alarmingly, we find that in 1999 nearly 66% of India's poor people were deeply or intensely poor – or both. Happily, we find that the share of people who are both deeply *and* intensely poor has gone down the most. However, there is no cause yet for celebration because still in 2006, 29.8% of the population were either intensely poor or deeply poor and 13.9%, or more than 140 million people, were simultaneously intensely poor and deeply poor.[40] This number is larger than the total population of Japan.

Let us now discuss some issues that lie beyond the scope of this paper but require further research and serious attention. First, in the current paper, we show differing patterns of change in income poverty and multidimensional poverty at the state level. It is imperative to explore the relationship between income poverty and multidimensional poverty at a more micro- level. However, neither of the two existing nationally representative surveys with inter-temporal datasets allows such comparisons. The National Family Health Surveys do not collect any information on household incomes or consumption expenditures and the National Sample Surveys do not collect any information on the anthropometric indicators such as the nutritional status of household members. Alkire and Kumar (2012) try to explore the agreement between income poverty and multidimensional poverty in three districts of Rajasthan and Madhya

[40] Results hold for any population figure taken from 2001–2011.

Pradesh and find little concordance between these two approaches. There is a need to conduct this type of analysis at the national level and across different population subgroups, including inter-temporal analysis.

Second, the selection of indicators has not allowed proper representation of the households with only old members. The NFHS datasets do not collect any anthropometric information from those households that do not have woman of reproductive age. Further research is required to analyse multidimensional poverty among these under-represented households. Third, we have seen that rural multidimensional poverty has decreased much faster than the urban poverty. At the same time, however, there has been a large migration of people from rural areas to urban areas. The analysis of migration between rural and urban areas was beyond the scope of this paper and further research is required in this area in the Indian context. Fourth, the analysis of India's deeply and intensely poor needs to be repeated for other countries. Finally and significantly, no National Family Health Survey has been conducted since 2005–06 after the third round of the survey. The type of analysis pursued in this paper is important, but, at present, it cannot be updated to show poverty trends after 2006. It is vital that poverty data be available more frequently than every seven years or eight years.

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Appendix

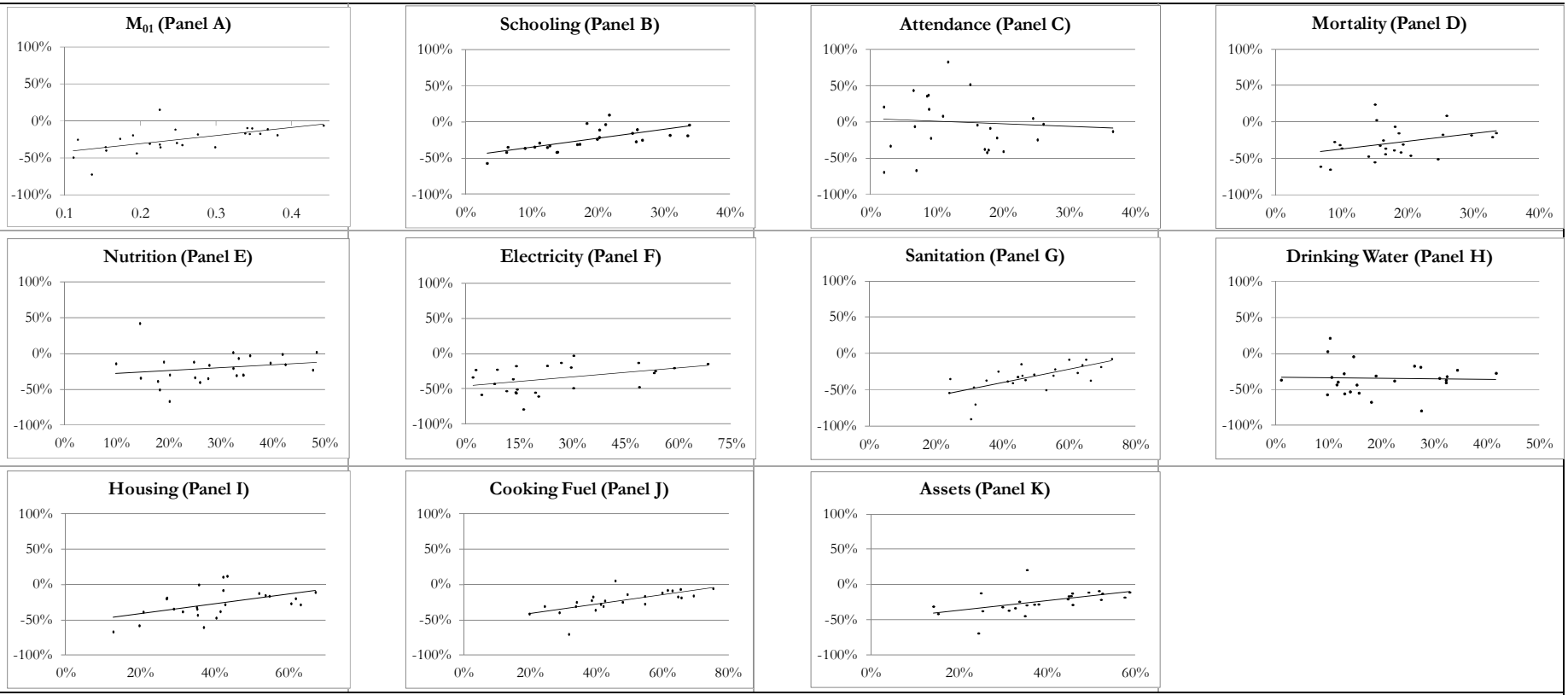
Table A1: Change in Multidimensional Poverty and Income Poverty in Rural Areas across States in India

	1999				2006				Income Poverty		Change		
Rural Areas in	**Population Share**	M_{01}	H_1	A_1	**Population Share**	M_{01}	H_1	A_1	**1993/94**	**2004/05**	M_{01}	H_1 **(p.a.)**	**Income Poverty (p.a.)**
Andhra Pradesh	6.1%	0.371	69.7%	53.2%	4.8%	0.245	52.1%	46.9%	48.1%	32.3%	-0.126	-2.5%	-1.4%
Arunachal Pradesh	0.1%	0.244	51.0%	47.9%	0.1%	0.294	57.4%	51.2%	60.0%	33.6%	0.050	0.9%	-2.4%
Assam	2.3%	0.363	69.1%	52.6%	2.2%	0.321	61.4%	52.3%	54.9%	36.4%	-0.042	-1.1%	-1.7%
Bihar	9.2%	0.470	80.4%	58.5%	8.8%	0.468	80.2%	58.3%	63.1%	43.5%	-0.003	0.0%	-1.8%
Goa	0.1%	0.135	29.6%	45.5%	0.1%	0.088	20.7%	42.4%	25.5%	28.1%	-0.047	-1.3%	0.2%
Gujarat	2.9%	0.345	65.5%	52.6%	2.9%	0.253	50.9%	49.7%	43.1%	39.1%	-0.092	-2.1%	-0.4%
Haryana	1.5%	0.240	50.6%	47.4%	1.4%	0.190	40.9%	46.5%	40.0%	24.8%	-0.049	-1.4%	-1.4%
Himachal Pradesh	0.6%	0.166	39.2%	42.4%	0.5%	0.110	26.6%	41.2%	36.7%	25.0%	-0.057	-1.8%	-1.1%
Jammu	0.8%	0.268	54.1%	49.5%	0.7%	0.187	40.2%	46.5%	32.5%	14.1%	-0.081	-2.0%	-1.7%
Karnataka	3.5%	0.333	64.9%	51.3%	3.4%	0.236	50.6%	46.6%	56.6%	37.5%	-0.097	-2.0%	-1.7%
Kerala	2.5%	0.154	36.4%	42.3%	1.7%	0.045	11.2%	40.2%	33.9%	20.2%	-0.109	-3.6%	-1.2%
Madhya Pradesh	6.2%	0.436	78.7%	55.4%	6.5%	0.392	73.6%	53.3%	50.9%	54.0%	-0.043	-0.7%	0.3%
Maharashtra	5.5%	0.326	64.8%	50.3%	4.9%	0.242	50.6%	47.7%	59.3%	47.9%	-0.084	-2.0%	-1.0%
Manipur	0.2%	0.247	51.0%	48.4%	0.1%	0.175	38.2%	46.0%	64.4%	39.3%	-0.071	-1.8%	-2.3%
Meghalaya	0.2%	0.415	76.5%	54.2%	0.2%	0.361	66.0%	54.6%	38.0%	14.0%	-0.054	-1.5%	-2.2%
Mizoram	0.0%	0.255	52.3%	48.8%	0.0%	0.159	35.3%	45.2%	16.6%	23.0%	-0.096	-2.4%	0.6%
Nagaland	0.1%	0.278	55.8%	49.8%	0.1%	0.258	52.0%	49.6%	20.1%	10.0%	-0.020	-0.5%	-0.9%
Orissa	3.4%	0.401	74.5%	53.9%	3.1%	0.344	64.8%	53.1%	63.0%	60.8%	-0.057	-1.4%	-0.2%
Punjab	1.7%	0.156	34.1%	45.9%	1.6%	0.108	23.6%	45.8%	20.3%	22.1%	-0.048	-1.5%	0.2%
Rajasthan	4.0%	0.403	74.1%	54.4%	4.4%	0.382	70.8%	54.0%	40.8%	35.8%	-0.021	-0.5%	-0.5%
Sikkim	0.0%	0.191	39.6%	48.2%	0.0%	0.156	34.0%	45.7%	33.0%	31.8%	-0.035	-0.8%	-0.1%
Tamil Nadu	4.3%	0.250	54.1%	46.2%	2.9%	0.151	35.9%	42.0%	51.0%	37.5%	-0.099	-2.6%	-1.2%
Tripura	0.3%	0.306	61.8%	49.5%	0.3%	0.249	50.9%	48.9%	34.3%	44.5%	-0.057	-1.6%	0.9%
Uttar Pradesh	11.5%	0.403	74.3%	54.2%	13.1%	0.363	68.2%	53.2%	50.3%	42.4%	-0.040	-0.9%	-0.7%
West Bengal	6.3%	0.409	73.0%	56.0%	5.6%	0.359	67.2%	53.5%	42.5%	38.2%	-0.050	-0.8%	-0.4%

Table A2: Change in Multidimensional Poverty and Income Poverty in Urban Areas across States in India

	1999				2006				Income Poverty		Change		
Urban Areas in	**Population Share**	M_{01}	H_1	A_1	**Population Share**	M_{01}	H_1	A_1	**1993/94**	**2004/05**	M_{01}	H_1 **(p.a.)**	**Income Poverty (p.a.)**
Andhra Pradesh	2.2%	0.095	20.0%	47.8%	2.3%	0.089	19.8%	44.9%	35.2%	23.4%	-0.007	0.0%	-1.1%
Arunachal Pradesh	0.0%	0.107	22.6%	47.2%	0.0%	0.160	33.7%	47.5%	22.6%	23.5%	0.053	1.6%	0.1%
Assam	0.2%	0.120	25.4%	47.4%	0.5%	0.108	23.3%	46.6%	27.7%	21.8%	-0.012	-0.3%	-0.5%
Bihar	1.2%	0.217	41.6%	52.0%	2.0%	0.190	35.7%	53.3%	43.5%	35.5%	-0.026	-0.9%	-0.7%
Goa	0.1%	0.077	16.6%	46.7%	0.1%	0.032	7.4%	43.8%	14.6%	22.2%	-0.045	-1.3%	0.7%
Gujarat	2.1%	0.112	23.1%	48.5%	2.0%	0.065	14.9%	43.5%	28.0%	20.1%	-0.047	-1.2%	-0.7%
Haryana	0.6%	0.067	14.7%	45.3%	0.6%	0.062	13.5%	46.1%	24.2%	22.4%	-0.004	-0.2%	-0.2%
Himachal Pradesh	0.1%	0.033	8.1%	40.7%	0.1%	0.017	4.2%	41.0%	13.6%	4.6%	-0.015	-0.5%	-0.8%
Jammu	0.2%	0.063	14.1%	44.7%	0.3%	0.035	8.4%	42.0%	6.9%	10.4%	-0.028	-0.8%	0.3%
Karnataka	1.8%	0.108	23.8%	45.3%	2.1%	0.073	16.5%	44.4%	34.2%	25.9%	-0.035	-1.0%	-0.8%
Kerala	0.8%	0.077	20.1%	38.4%	0.9%	0.025	6.4%	38.9%	23.9%	18.4%	-0.052	-2.0%	-0.5%
Madhya Pradesh	2.1%	0.168	34.8%	48.3%	2.2%	0.139	29.3%	47.4%	31.0%	33.7%	-0.029	-0.8%	0.2%
Maharashtra	4.1%	0.091	20.7%	43.9%	4.3%	0.055	12.7%	43.5%	30.3%	25.6%	-0.036	-1.1%	-0.4%
Manipur	0.1%	0.141	31.3%	45.1%	0.1%	0.088	19.8%	44.7%	67.2%	34.5%	-0.052	-1.6%	-3.0%
Meghalaya	0.0%	0.124	29.5%	42.1%	0.1%	0.090	19.9%	45.4%	23.0%	24.7%	-0.034	-1.4%	0.2%
Mizoram	0.0%	0.066	15.1%	43.5%	0.0%	0.034	8.3%	40.6%	6.3%	7.9%	-0.032	-1.0%	0.1%
Nagaland	0.0%	0.121	29.2%	41.5%	0.0%	0.104	22.6%	46.1%	21.8%	4.3%	-0.017	-0.9%	-1.6%
Orissa	0.4%	0.221	41.7%	52.9%	0.6%	0.135	28.6%	47.2%	34.5%	37.6%	-0.085	-1.9%	0.3%
Punjab	0.7%	0.026	6.3%	42.1%	0.9%	0.053	11.5%	45.9%	27.2%	18.7%	0.027	0.8%	-0.8%
Rajasthan	1.3%	0.152	31.3%	48.5%	1.6%	0.108	24.2%	44.7%	29.9%	29.7%	-0.044	-1.0%	0.0%
Sikkim	0.0%	0.050	11.5%	43.7%	0.0%	0.031	7.4%	42.5%	20.4%	25.9%	-0.019	-0.6%	0.5%
Tamil Nadu	2.3%	0.092	21.5%	42.7%	2.5%	0.064	15.6%	41.1%	33.7%	19.7%	-0.028	-0.8%	-1.3%
Tripura	0.1%	0.141	27.2%	52.0%	0.1%	0.105	23.4%	44.8%	25.4%	22.5%	-0.036	-0.5%	-0.3%
Uttar Pradesh	3.2%	0.149	30.6%	48.6%	4.1%	0.157	31.3%	50.2%	37.1%	33.6%	0.008	0.1%	-0.3%
West Bengal	2.1%	0.123	23.7%	52.1%	2.3%	0.099	21.2%	46.5%	31.2%	24.4%	-0.025	-0.3%	-0.6%

Table A3: Trend of Reduction in the Adjusted Headcount Ratio and the Censored Headcount Ratios across States in India



The horizontal axis of Panel A denotes the M_{01} in 1999 and the vertical axis denotes the percentage change in M_{01} between 1999 and 2006. For the rest of the figures, the horizontal axis reports the censored headcount ratio in 1999 for the respective indicator when $k = 1/3$. The vertical axis denotes the percentage change in censored headcount ratio between 1999 and 2006. Note that the reduction is not in percentage points. If the censored headcount ratio is denoted by x, then the horizontal axis denotes $\Delta x/x$ in%. While reporting the trends we have eliminated few outliers.

Table A4: Percentage Change in MPIs, Deprivations in Indicators, Censored Headcount Ratios and Change in the Contribution of Indicators to the MPIs across Geographic Regions

		Schooling			Attendance			Mortality			Nutrition			Electricity			Sanitation			Water			Housing			Cooking Fuel			Assets		
	M_0	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ
Rural	-13%	-13%	-14%	-	-7%	-9%	+	-13%	-15%	-	-6%	-9%	+	-12%	-15%	-	-11%	-15%	-	-31%	-34%	-	-11%	-15%	-	-1%	-11%	+	-10%	-14%	-
Urban	-17%	-16%	-15%	+	12%	4%	+	-17%	-20%	-	-17%	-22%	-	-14%	-15%	+	-17%	-22%	-	-18%	-37%	-	-43%	-34%	-	5%	-7%	+	-7%	-16%	+
States																														
Andhra P.	-35%	-23%	-27%	+	-32%	-41%	-	-39%	-46%	-	-25%	-30%	+	-58%	-60%	-	-18%	-30%	+	-62%	-68%	-	-28%	-38%	-	-9%	-27%	+	-12%	-28%	+
Arunachal P.	15%	12%	10%	-	68%	52%	+	26%	25%	+	40%	42%	+	-20%	-17%	-	-32%	-14%	-	-10%	-4%	-	-5%	11%	-	-13%	5%	-	3%	21%	+
Assam	-17%	-25%	-25%	-	-18%	-22%	-	-1%	-6%	+	5%	2%	+	-14%	-20%	-	-22%	-26%	-	-26%	-34%	-	-13%	-20%	-	-11%	-17%	+	-15%	-21%	-
Bihar	-6%	-5%	-4%	+	-11%	-13%	-	13%	9%	+	2%	2%	+	-16%	-14%	-	-4%	-7%	-	-28%	-31%	-	-10%	-11%	-	-4%	-6%	+	-9%	-11%	-
Goa	-49%	-26%	-35%	+	-20%	-33%	+	-49%	-61%	-	-24%	-51%	-	-51%	-58%	-	-46%	-53%	-	-41%	-53%	-	-52%	-58%	-	-19%	-41%	+	-28%	-41%	+
Gujarat	-29%	-26%	-31%	-	-32%	-39%	-	-26%	-30%	-	-9%	-21%	+	-31%	-36%	-	-24%	-30%	-	-18%	-28%	+	-41%	-43%	-	-4%	-23%	+	-20%	-28%	+
Haryana	-19%	-31%	-35%	-	4%	8%	+	-23%	-32%	-	2%	-12%	+	-18%	-22%	-	-19%	-24%	-	-24%	-40%	-	-18%	-20%	-	3%	-17%	+	-5%	-12%	+
Himachal P.	-35%	-37%	-42%	-	28%	21%	+	-25%	-31%	+	-17%	-35%	+	-36%	-33%	+	-20%	-36%	-	-40%	-56%	-	-31%	-38%	-	8%	-31%	+	-29%	-37%	-
Jammu	-35%	-39%	-42%	-	-27%	-38%	-	-30%	-38%	-	-28%	-34%	+	-33%	-42%	-	-8%	-32%	+	-26%	-38%	-	-27%	-32%	+	-8%	-31%	+	-21%	-33%	+
Karnataka	-32%	-29%	-31%	+	-39%	-42%	-	-35%	-41%	-	-22%	-30%	+	-46%	-50%	-	-21%	-28%	+	32%	3%	+	-24%	-35%	-	-5%	-25%	+	-8%	-28%	+
Kerala	-72%	-46%	-57%	+	-57%	-69%	+	-47%	-65%	+	-24%	-67%	+	-69%	-78%	-	-90%	-90%	-	-59%	-80%	-	-27%	-67%	+	-11%	-70%	+	-45%	-69%	+
Madhya P.	-11%	-16%	-16%	-	-24%	-25%	-	-19%	-20%	-	-1%	-1%	+	-10%	-12%	-	0%	-8%	+	-18%	-23%	-	14%	12%	+	1%	-7%	+	-4%	-9%	+
Maharashtra	-31%	-43%	-42%	-	29%	18%	+	-35%	-43%	-	-19%	-31%	+	-4%	-17%	+	-15%	-32%	-	-49%	-55%	-	-51%	-47%	-	-5%	-22%	+	-17%	-29%	+
Manipur	-30%	-35%	-35%	-	41%	37%	+	-29%	-36%	-	-24%	-30%	+	-49%	-55%	-	-23%	-40%	-	-4%	-37%	-	-8%	-28%	+	-7%	-28%	+	-39%	-44%	-
Meghalaya	-17%	-19%	-19%	-	146%	126%	+	-48%	-50%	-	-8%	-16%	+	-48%	-47%	-	-36%	-37%	-	-26%	-27%	-	-26%	-27%	-	-14%	-19%	-	-10%	-18%	-
Mizoram	-40%	-36%	-36%	+	9%	-6%	+	-17%	-36%	+	-23%	-39%	+	-50%	-52%	-	-70%	-70%	-	-40%	-44%	-	-7%	-34%	+	-37%	-40%	-	-27%	-36%	+
Nagaland	-11%	0%	-2%	+	90%	83%	+	-24%	-25%	-	-2%	-12%	-	-55%	-48%	-	-37%	-36%	-	-23%	-32%	-	0%	-8%	+	-10%	-14%	-	-16%	-16%	-
Orissa	-19%	-10%	-10%	+	-3%	-4%	+	-13%	-17%	+	-22%	-23%	-	-18%	-24%	-	-8%	-18%	+	-34%	-41%	-	-24%	-28%	-	-1%	-16%	+	-4%	-12%	+
Punjab	-25%	-20%	-29%	-	79%	44%	+	-17%	-27%	-	-22%	-34%	-	-12%	-23%	+	-29%	-34%	-	-37%	-37%	-	-30%	-39%	-	-7%	-31%	-	-22%	-31%	-
Rajasthan	-9%	-2%	-3%	+	-2%	-3%	+	-15%	-18%	-	-13%	-13%	-	0%	-2%	+	1%	-8%	+	-19%	-19%	-	-1%	0%	+	-3%	-8%	+	-7%	-11%	-
Sikkim	-24%	-21%	-21%	+	43%	36%	+	-53%	-55%	-	-12%	-14%	+	-57%	-56%	-	-37%	-46%	-	51%	21%	+	-5%	-19%	+	-18%	-25%	-	-21%	-24%	+
Tamil Nadu	-43%	-24%	-33%	+	-61%	-67%	-	-35%	-47%	-	-27%	-40%	+	-48%	-54%	-	-8%	-38%	+	-36%	-57%	-	-58%	-61%	-	-9%	-36%	+	-12%	-31%	+
Tripura	-18%	-25%	-24%	-	-21%	-22%	-	10%	3%	+	6%	-7%	+	-15%	-19%	-	-48%	-50%	-	-18%	-17%	+	-7%	-16%	+	-3%	-17%	+	-15%	-20%	-
Uttar P.	-10%	-11%	-11%	-	10%	5%	+	-13%	-15%	-	-2%	-3%	+	-10%	-12%	-	-16%	-15%	-	-39%	-43%	-	-9%	-12%	-	-2%	-9%	+	-15%	-16%	-
West Bengal	-16%	-18%	-18%	-	-5%	-9%	+	-12%	-15%	+	-13%	-15%	+	-25%	-27%	-	-11%	-21%	-	-26%	-33%	-	-10%	-15%	+	-3%	-12%	+	-11%	-12%	+

The table presents the percentage change in the multidimensional poverty indices (M_0) and the percentage changes in the proportion of population deprived (%Dp.) and the censored headcount ratio (CHR) of each indicator. The table also reports the change in the contribution (ϕ) of each indicator to the M_0 over the years. If the contribution increases then it is denoted by a '+' sign and if the contribution decreases, it is denoted by a '-' sign. For example, Kerala has registered a large improvement in sanitation, electricity and water and as a result, the contribution of these three indicators has gone down in 2006.

Table A5: Percentage Change in MPIs, Deprivations in Indicators, Censored Headcount Ratios and Change in the Contribution Indicators to the MPIs across Social Groups and Household Characteristics

		Schooling			Attendance			Mortality			Nutrition			Electricity			Sanitation			Water			Housing			Cooking Fuel			Assets		
Castes	M_0	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ	%Dp.	CHR	ϕ
SC	-19%	-23%	-24%	-	-16%	-19%	+	-15%	-19%	-	-11%	-14%	+	-16%	-20%	-	-11%	-19%	-	-35%	-39%	-	-17%	-20%	-	-3%	-15%	+	-11%	-18%	+
ST	-9%	-13%	-13%	-	-11%	-12%	-	-3%	-3%	+	-1%	-2%	+	-14%	-14%	-	-6%	-10%	-	-16%	-19%	-	-8%	-10%	-	-1%	-7%	+	-6%	-9%	-
OBC	-14%	-10%	-11%	+	-1%	-5%	+	-13%	-16%	-	-10%	-13%	+	-13%	-15%	-	-11%	-15%	-	-34%	-38%	-	-22%	-21%	-	-2%	-11%	+	-11%	-17%	-
General	-28%	-24%	-25%	+	-7%	-15%	+	-26%	-33%	-	-17%	-25%	+	-26%	-30%	-	-26%	-35%	-	-41%	-54%	-	-27%	-30%	-	-9%	-26%	+	-21%	-30%	-
Religion																														
Hindu	-19%	-19%	-20%	-	-12%	-16%	+	-16%	-20%	-	-10%	-15%	+	-18%	-21%	-	-13%	-19%	-	-31%	-37%	-	-20%	-22%	-	-4%	-16%	+	-13%	-19%	-
Muslim	-6%	-3%	-3%	+	12%	10%	+	-7%	-9%	-	-7%	-8%	-	-8%	-6%	-	-16%	-14%	-	-41%	-42%	-	-11%	-8%	-	2%	-4%	+	-7%	-10%	-
Christian	-19%	-5%	-9%	+	35%	32%	+	-31%	-32%	-	-14%	-20%	-	-33%	-29%	-	-39%	-32%	-	-29%	-33%	-	-21%	-19%	+	-9%	-20%	-	-15%	-22%	-
Sikh	-33%	-34%	-40%	-	55%	31%	+	-19%	-38%	-	-25%	-41%	-	-41%	-39%	-	-39%	-42%	-	-32%	-39%	-	-29%	-37%	-	-3%	-34%	-	-35%	-38%	-
Other	0%	-3%	-1%	-	21%	19%	+	-17%	-9%	-	-5%	-3%	-	14%	7%	+	-3%	-1%	-	-18%	-14%	-	-25%	-14%	-	18%	10%	+	2%	7%	+
Head's Gender																														
Female	1%	11%	9%	+	15%	14%	+	2%	3%	+	3%	2%	+	-1%	4%	+	-13%	-6%	-	-46%	-48%	-	-12%	-5%	-	1%	2%	+	-7%	-4%	-
Male	-18%	-20%	-21%	-	-7%	-12%	+	-16%	-20%	-	-10%	-15%	+	-18%	-21%	-	-14%	-20%	-	-30%	-36%	-	-20%	-21%	-	-3%	-15%	+	-13%	-19%	-
HH Size																														
1-3	-22%	-14%	-18%	+	-3%	-7%	+	-18%	-23%	-	-18%	-23%	-	-24%	-27%	-	-12%	-21%	+	-37%	-45%	-	-24%	-26%	-	-4%	-17%	+	-14%	-21%	+
4-5	-20%	-25%	-25%	-	-4%	-11%	+	-17%	-22%	-	-7%	-13%	+	-20%	-23%	-	-15%	-21%	-	-34%	-41%	-	-23%	-24%	-	-4%	-16%	+	-15%	-21%	-
6-7	-11%	-20%	-19%	-	-1%	-5%	+	-6%	-9%	+	-1%	-5%	+	-11%	-12%	-	-12%	-14%	-	-30%	-33%	-	-15%	-15%	-	1%	-9%	+	-12%	-15%	-
8-9	-6%	-12%	-10%	-	8%	3%	+	-3%	-6%	+	-1%	-4%	+	-7%	-6%	+	-13%	-12%	-	-26%	-27%	-	-12%	-9%	-	1%	-5%	+	-11%	-11%	-
10 & More	-12%	-40%	-39%	-	17%	14%	+	-8%	-10%	+	-4%	-8%	+	-16%	-18%	-	-18%	-20%	-	-31%	-33%	-	-21%	-22%	-	-2%	-11%	+	-21%	-24%	-

The table presents the percentage change in the multidimensional poverty indices (M_0) and the percentage changes in the proportion of population deprived (%Dp.) and the censored headcount ratio (CHR) of each indicator. The table also reports the change in the contribution (ϕ) of each indicator to the M_0 over the years. If the contribution increases then it is denoted by a '+' sign and if the contribution decreases, it is denoted by a '-' sign.